PREMIERE ISSUE

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## Columns

Anand Lal Shimpi
Alex "Sharky" Ross
Chris Pirillo
Pete Loshin
Lisa Lopuck
Joan Wood
Alex St. John

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GeForce3 Ti Chipset
Athlon XP

Enter The World Of ATI's
**SmartShader Technology**


## Q&A

With The Father Of The Internet:

**Vint Cerf**

## NOTEBOOKS

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# Spotlight





## Frontside



## The Experts















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## Heavy Gear



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## Caught In The Web



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## Tips & Tricks

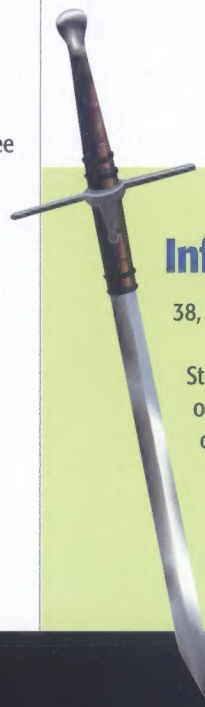


## What's Cooking



## Back Door





## Infinite Loops

38, 76, 91, 105

Strange stats and other oddball items from computing's periphery

## Greetings From Samitland

Ladies and gentlemen, I won't take much of your time, and I'll keep the PR-style drivel to a minimum <spinning up Strauss' "Also Sprach Zarathustra" from 2001: A Space Odyssey soundtrack>. I just wanted to welcome you to the premiere issue of *Computer Power User* magazine on behalf of everyone who has worked so diligently to cobble this together for you. We put together a magazine that *we* would want to read; we think you will too.

Flip through and see what you think. We have a lot of material packed into these pages with very minimal advertising. We hope you find the magazine informative, entertaining, and even a little interactive. Oh, and don't forget to check out opinions from our panel of experts. Allow me to give you a quick introduction (though I don't think they really need it):

**Alex St. John**. We call him The Saint. Alex was the co-creator of a small API (perhaps you've heard of it?) called DirectX. He's also the founder of WildTangent (see page 47). The Saint's a busy man these days with a lot up his sleeve. Look upward and listen.

**Anand Lal Shimpi**. The hardware guru that brought you AnandTech.com has a lot to say. As a bonus, we have an exclusive first look at his new book, "The AnandTech Guide To PC Gaming Hardware" on page 92.

**Alex "Sharky" Ross**. The Brit with an attitude. Alex founded SharkyExtreme.com and is now on early retirement. Apparently retirement's not all that it's cracked up to be. That's good for *CPU*; all that extra free time allows him to take up with us.

**Chris Pirillo**. TechTV host and the founder of Windows' tip site LockerGnome. Chris' software and technology-related newsletters are read daily by a lot of people. (Probably even you.) He's here to talk Windows.

**Pete Loshin**. You might remember Pete as the reviews editor from the venerable *BYTE* magazine. We loved that mag. This man is no mouse monkey; he knows his open source and is a vocal proponent of all things open. You just have to open your eyes.

**Lisa Lopuck**. She's here to give you the skinny on Web design. Lisa is a leading Web designer, book author (no, go look her up on Amazon.com yourself!), and founder of eHandson.com.

**Joan Wood**. Last but not least is our dear friend Joan. She co-founded Xatrix Entertainment (fortunately, she left before Redneck Rampage) and more recently Mango Grits (remember Barrage, published by Activision?). She has some good stuff to share about the world of the Internet.

And we're not done yet. Not by a long shot. So what can you expect to see from us in the future? Naturally, more cutting-edge reviews, tips, and articles to keep you informed of the latest developments in computing and technology. We want any suggestions you have. Give us a holler when you have a moment and tell us what you think. You can reach us at editor@cpumag.com. Thanks, and enjoy the mag!

**Samit G. Choudhuri, Publication Editor, *CPU***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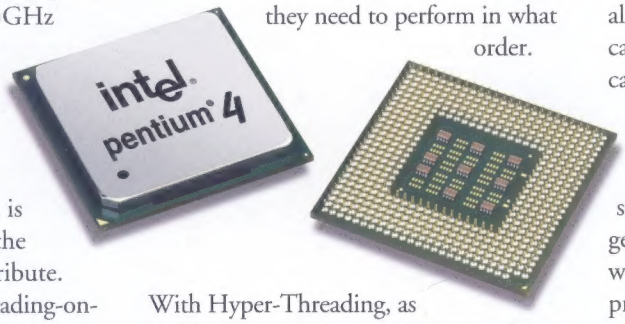
Compiled by Cal Clinchard

## In Hardware . . .

# Here Comes Hyper-Threading

Intel recently demonstrated a Pentium 4 processor that runs at 3.5GHz, almost double the speed of the fastest chip currently available, as well as a so-called Hyper-Threading chip. While the first chip's 3.5GHz speed is noteworthy, Intel has played down that hype and claims the Pentium 4 will scale up to 10GHz before the next-generation chip comes along. Productivity, Intel says, is key, and Hyper-Threading is the breakthrough productivity attribute.

A kind of steroidal multithreading-on-a-chip, Hyper-Threading lets a single processor pretend to be two processors and thereby fool the OS and compatible apps into seeing the single processor as a two-processor platform. Traditional processors handle multithreading applications by deciding what tasks they need to perform in what order.




With Hyper-Threading, as Intel spokesperson Otto Pijpker explains, the processor looks at the different streams of incoming data and switches from one data stream to the other every few nanoseconds. This makes processing "so fast that to the operating system it makes it look like two processors are doing the work."

According to Pijpker, many applications in the server market segment already have built-in multithreading capabilities, and for these types of applications Hyper-Threading provides, on average, 30% performance increases. "Multithreaded apps are more common in [the server segment] space," says Pijpker, "so it makes sense to target that space initially. Eventually you will see [Hyper-Threading] in our other processors." Hyper-Threading is on track to ship in server and desktop systems in the first half of 2003. ▲

## The Next Step In Wireless Evolution

Using its so-called "Radio-on-a-Chip" (RoC), Atheros Communications (www.atheros.com) of Sunnyvale, Calif., has developed the next big thing in wireless LAN semiconductor technology. The company's new chipset, inconspicuously named the AR5000, includes the 5GHz RoC, which is compliant with the IEEE 802.11a standard for speeds up to 54Mbps, five times the speed of 2.4GHz products currently on the market. And in "turbo mode," the chipset delivers speeds up to 72Mbps. At these speeds and with high-powered multitasking capabilities, the AR5000 is ripe for use in demanding multimedia applications (think wireless HDTV in every room of the house) that slower networks don't support.


What's more, Atheros creates this lightning-speed magic using the established and economical standard-process CMOS. The result is a chipset that consumes as little as one-sixth the energy burned by the average 2.4GHz product, making it ideal for use in battery-powered devices, such as handheld PCs and notebooks. And interference from cordless phones doesn't bother the AR5000. Assuming it lives up to its cross-industry potential, the AR5000 will likely become the ubiquitous wireless component most users have never heard of. ▲

## Forget The Jet Skis: Buy A New Couch

Already big in Europe for ordering pizzas and general surfing, interactive TV is developing an American stronghold, and its presence is bolstered by the release of products such as Lexmark's i3 (www.lexmark.com). Set to begin shipping in late 2001 with a $139 price tag, the i3 is a 4-inch tall, stackable inkjet printer (it supports 20 pounds) with a sleek black and silver case designed to fit nicely into any video-head's living room. But for a printer of this size and cost, it's bound to turn PC users' heads, as well. If you're going to swap that clunky CRT for an LCD, why not get rid of your bulky printer in favor of the jazzy little i3?

The i3 connects to PCs via USB and is compatible with Win98/2000/Me/XP. For interactive TV, Lexmark cautions that compatibility varies depending on your region and cable company but claims it'll work with MSTV, PowerTV, and Linux. It delivers 2,400 x 1,200 dpi photo-quality print jobs in either black and white or color at a rate of up to eight pages per minute. Whether you bank or shop online or simply surf the Web from your couch, the i3 should further reduce wear and tear on your living room carpet. ▲

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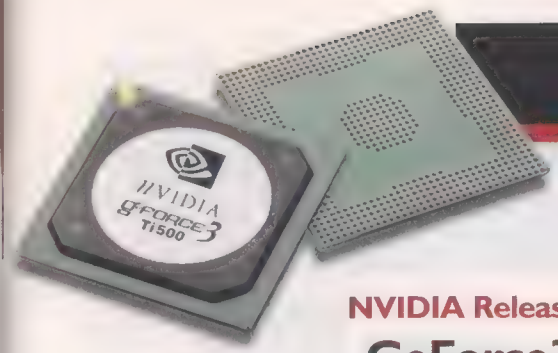



### NVIDIA Releases

## GeForce3 Titanium Series Graphics Chips

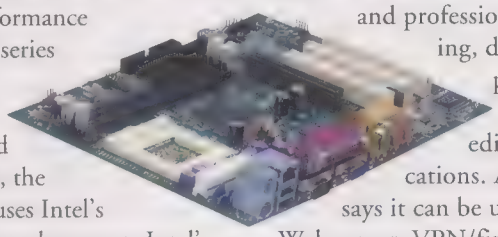
Graphics powerhouse NVIDIA released its latest GPUs, the GeForce3 Titanium series, in October, proving that NVIDIA's production goals reach beyond Moore's Law expectations. The high-end version, the 64MB GeForce3 Titanium 500 (Ti 500), provides 1.5 times the performance of its predecessor, the 64MB GeForce3, which debuted this spring. If you're not salivating already, you will be because NVIDIA is selling the 64MB GF3 Ti 500 for the same price ($399 retail) as the earlier 64MB GF3.

The new chips feature improvements in 3-D shadow buffering and volumetric textures, which lets developers define 2-D textures in three dimensions, calculating how objects look on the inside. Volumetric texturing is licensed by Microsoft for inclusion in Direct3D and will most likely be used in games for exploding objects and for creating realistic-looking smoke, clouds, and fog. The chips also feature Detonator XP, which reportedly provides substantial performance gains for WinXP users.

And for those of you whose wives restrict how much you can spend on computer stuff, NVIDIA also released the 64MB GF3 Ti 200, which matches the performance of the 64MB GF3 but sells for around $200. There's also a new 64MB GF2 Ti, which rivals the old 64MB GF2 Ultra but has a cheaper price tag. Read our full review on page 16. ▲

## Latest Mother Of All Embedded Motherboards

Leading BIOS manufacturer AMI (American Megatrends; www.ami.com) recently unveiled its new embedded motherboard, the high-performance Olympus II (series 821). A single processor embedded motherboard, the Olympus II uses Intel's 815E chipset and supports Intel's Pentium III Coppermine and Celeron processors.



The Olympus II features a 133MHz frontside bus, three PCI slots, one AGP slot, 512MB of SDRAM, and supports up to four drives. AMI claims the Olympus II is an ideal solution for ISPs and professional imaging, desktop publishing, and video editing applications. AMI also says it can be used for Web server, VPN/firewall, and Internet appliances, as well as home PCs. The Olympus II is currently in full production. ▲

## Semiconductor Breakthrough

### Could Save You Money

Don't be surprised if the cost of broadband arrows down while quality improves. Motorola Labs (www.motorola-labs.com) recently made a breakthrough in semiconductor manufacturing by successfully placing transistors in a thin layer of high-performance GaAS (gallium arsenide) that was grown on top of a silicon chip. GaAs is a semiconductor material in the III-V group, which also includes indium phosphide and gallium nitride. Prior to Motorola's achievement, no one could successfully get best-in-class III-V materials to grow on silicon substrate.

"The spacing between atoms in a silicon crystal is different from those in III-V semiconductor materials," says Dr. Jim Pendergast, vice president and director of Motorola's Physical Sciences Research Lab. "The two crystalline semiconductor materials are dissimilar enough in structure that prior industry attempts to combine them resulted in dislocations or 'cracks' in the material. Motorola resolved this issue through the clever use of an intermediate crystalline oxide."

Motorola cautions that this development is just a first step but claims the technology can be used to support processor clock speeds of 70GHz and long-wavelength lasers. The bottom line for fiber-optics manufacturers and chipmakers is that, using this technology, they will be able to produce products using more efficient and less expensive materials. "The use of compound semiconductors is growing in all market segments, and this technology's ability to integrate light-emitting and receiving capabilities with silicon offers enormous potential to further accelerate that trend," says Pendergast, "particularly for telecom lasers and detectors and integrated circuits for wireless communications, optical, and networking markets."

The bottom line for consumers lies even further down the road but could result in faster and cheaper computers and other electronics, such as wireless communication, data storage, and DVD players. ▲

In Software . . .


## Satisfaction For Black Mesa Addicts

Anyone who longs to return to the Black Mesa Federal Research Facility, where a covert scientific project is underway, will find satisfaction in Sierra's release of Half-Life: Blue Shift (www.sierrastudios.com/games/hl-blueshift), sequel to the highly popular interactive game Half-Life. What's even better is that with Half-Life: Blue Shift comes a high definitions upgrade for users still playing the original game.

In Half-Life: Blue Shift, designed by Gearbox Software, you become Barney, a security guard with a helmet that looks like what the "Star Wars" rebels wore, and you get more of the same: gnarly monsters and military scientists gone bad. You may enjoy being able to access more Black Mesa areas that were off-limits in the original, but the real thrill is the sequel's improved 3-D animation and new storyline.

The game runs on Win9x/NT/2000/Me and requires a Pentium 233MHz or AMD K6-2 with 32MB RAM, 400MB hard drive space, 2X CD-ROM drive, SVGA display, Windows-compatible sound card, and 32-bit ISP with 28.8Kbps or better modem or LAN. Who doesn't have that? It also comes with a bonus game: Half-Life: Opposing Force. ▲

## Hitchhiker In Progress

A video game version of "The Hitchhiker's Guide To The Galaxy" was inevitable, but not in the ways you might think, unless you know something about the public life of the novel's author, Douglas Adams. The story was first a BBC radio series, then a wildly popular novel with four best-selling sequels, and along the way a BBC television series.

Dentrassi Fryingpan as depicted in the upcoming Hitchhiker's Guide To The Galaxy Game from Phase 3 Studios and Pan Interactive.

Adams reveled in the idea of bringing his story to life on the big screen, but initial attempts went nowhere. At the time of his death from a heart attack on May 11, 2001, Adams was working on a film version for Disney, but now it's unclear whether this will come to fruition.

But it was Adams's preoccupation with computers that made developing the story into a video game a foregone conclusion. An early advocate for the popularization of the Internet and e-mail communication and always eager to have his books transformed into electronic format, Adams was also a video game fan. He even launched a development company called The Digital Village and helped create the "comedy science-fiction adventure" game Starship Titanic, a cult smash hit.

So even if no one else thought to turn "The Hitchhiker's Guide To The Galaxy" into an interactive 3-D video game, it's not surprising that Adams pursued it himself. As it stands, Phase 3 Studios, a joint effort of The Digital Village and European software publisher PAN Interactive, is working on the game, wherein the groggy antihero Arthur Dent wakes up one morning to find that Earth is about to be razed to make way for an interplanetary highway, and subsequently stumbles through sectors of the galaxy filled with characters familiar to fans.

President of the Galaxy Zaphod Beeblebrox is there, as well as the ever-depressive Marvin the Paranoid Android, and Ford Prefect, a sort of intergalactic Huck Finn to Arthur Dent's unlikely lead. A release date hasn't been set for the game, but it will initially go on sale in Europe; American fans will have to wait a while longer. According to Peter Noble, public relations representative for PAN Interactive, a Windows/Mac OS version probably won't be available in the states until the latter half of 2002. ▲

**Introducing the new Palm™ m500 handheld.** Inside its sleek little chassis, we've added an expansion slot so you can turn it into the ultimate photo album or eBook. The optional SD cards also let you back up or increase memory, or even access worldwide travel guides. As for included applications, you can download email, import and update Excel spreadsheets, even customize and manage web content with the MyPalm™ portal. We also included mobile connectivity software—add a modem or compatible mobile phone and your information can be accessed wirelessly. It's time to mobilize.

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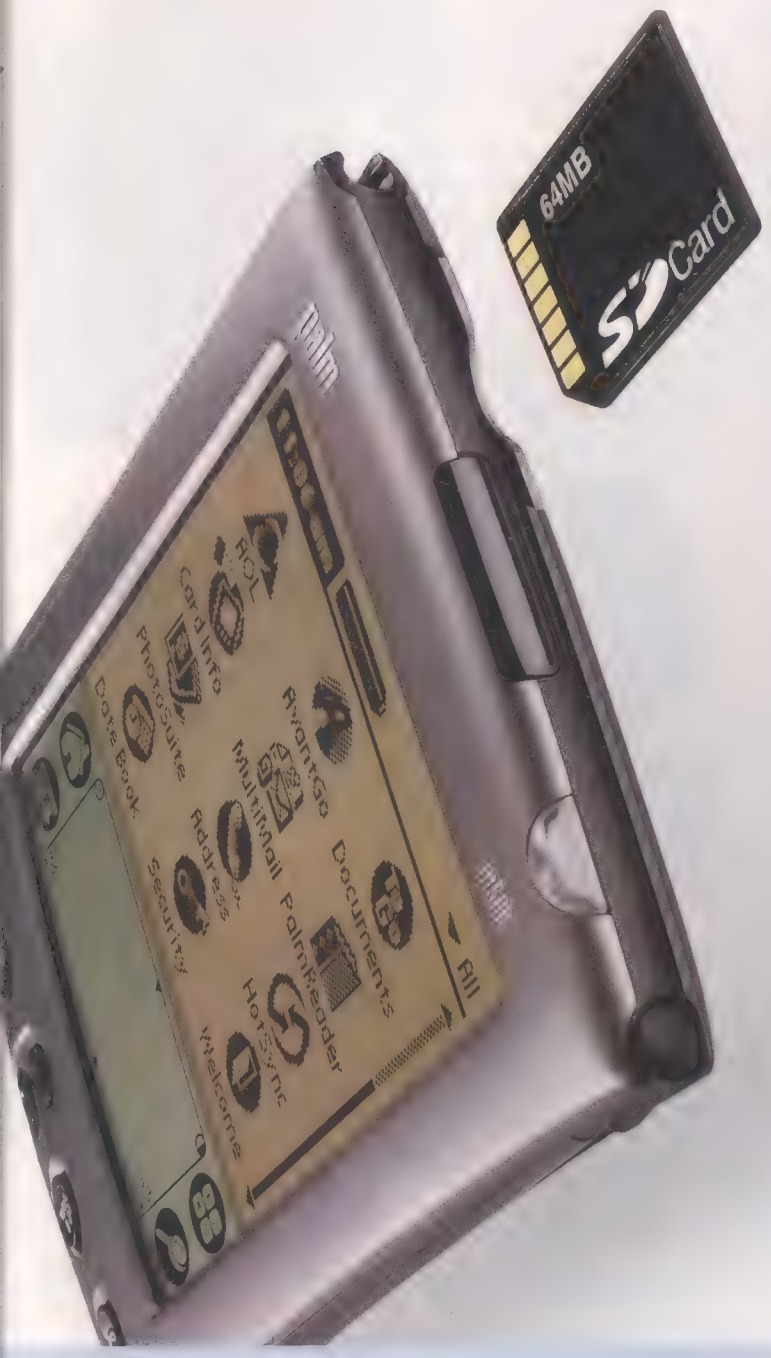



the last thing you bought
this expandable
had an elastic waist.

palm powered

**Available at:** Best Buy Circuit City CompUSA Office Depot OfficeMax Staples

SD expansion cards are sold separately and not included with handheld. SD card shown is an example of available storage capacity. Storage capacity may vary. The m500 handheld requires an Internet account, modem or data-enabled mobile phone and/or third-party software for email and Internet access, sold separately. Screen image is simulated. 

Internet . . .

## Who Beats Microsoft In Every Web Server Survey?

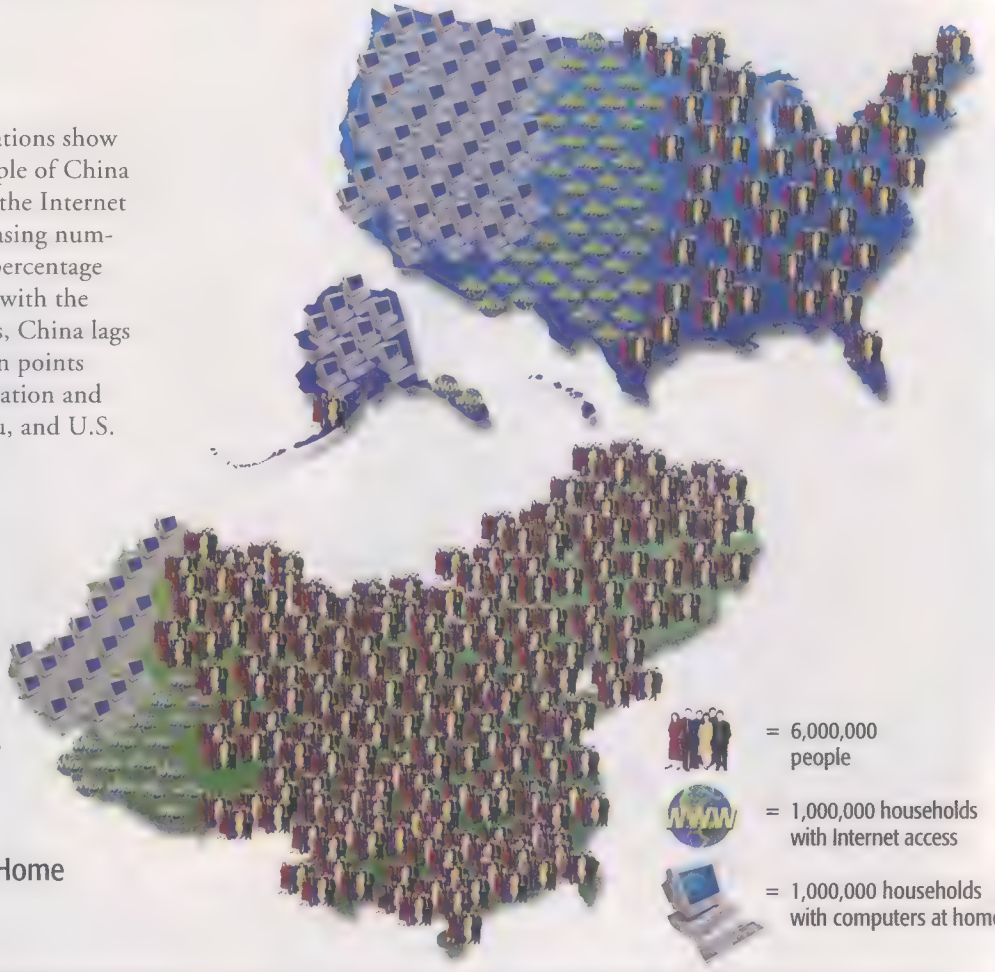
You could argue that the real Davids in the Apache vs. Microsoft David-and-Goliath struggle for the largest slice of the Web server pie are the servers getting pushed right off the chart. While the iPlanet Web server from Sun Microsystems hangs on to its 6% or 7%, servers from smaller companies are hovering just above the zero line. But looking at statistics from the past two years, Unix-based Apache keeps coming out on top (see chart), while the otherwise huge Microsoft keeps hugging a twenty-odd percent share with its Internet Information Server line.

How does Apache do it? It's free, something Microsoft doesn't seem able to compete with. Continued development by the Apache Software Foundation (www.apache.org), including the Apache XML project, indicates there's no slowdown in sight. Whether Apache's HTTP Server or Microsoft's IIS wins the contest for speed is debatable, but Apache seems to have a hefty client list on its side. To see the latest stats for yourself, visit the Netcraft Web site (www.netcraft.com). On the home page, you can enter a URL or Web site keyword to get the low-down on the site's server: what the site's running, the IP address, and more. ▲

Recent Web server statistics from Netcraft show a dominant Apache.

## China Online

All indications show the people of China tapping into the Internet in ever-increasing numbers, but in percentage comparisons with the United States, China lags far behind. Here are some comparison points taken from China Population Information and Resource Center, U.S. Census Bureau, and U.S. Department of Energy surveys. ▲



### Total Population In 2000
United States: 281.42 million
China: 1.3 billion

### Households With Internet Access
United States: 44.5 million
China: 17.2 million

### Households With Computers At Home
United States: 54 million
China: 19 million

= 6,000,000 people

= 1,000,000 households with Internet access

= 1,000,000 households with computers at home

## New Arrivals:
# Now On The 'Net

Here's a small sample of sites that have recently made their way to the Web.


**Message To Spyware Freaks: ScumWare Is On Your Case.** ScumWare (www.scumware.com) is on the offensive against unscrupulous shareware. The site hunts down and uncovers shareware that, in Trojan horse style, installs components on your PC to track your surfing and offline computing habits. We especially liked the Original ScumWare Rant and Spread The ScumWare Word. Click De-Scum Your Computer for information about removing unnecessary files. The site also provides negative press (ScumWare Hall Of Shame) and will soon also include positive reinforcement (ScumWare Heroes). ▲

Visit Retrofuture.com to learn more about optimistic technological pursuits, such as Morton Heilig's Sensorama Simulator.

**Selective Memory.** Ever wonder what happened to the lofty promises of a future filled with flying cars, perpetual leisure, and Smell-O-Vision? Eric Lefcowitz highlights the best of the future we never had with a new Web site called Retrofuture.com (www.retrofuture.com). Strictly for entertainment use (no wagering, please), Retrofuture.com offers up a time capsule of the unrealized dreams of optimists and profiteers alike. And if you're interested in who might deserve the dubious honor of being the first online merchant to spend huge amounts of cash only to crash and burn, click Archives and First Dot-Bomb. ▲

**Be Prepared Before You Get Poked.** Lab Tests Online (www.labtestsonline.org) provides valuable information about lab tests, including what they are, when they're used, and how to interpret the results. Brought to the Web by the American Association for Clinical Chemistry, Lab Tests Online home page lets you know up front what they cover and what they don't with scrollable lists for Tests, Conditions & Diseases, and Screening categories. The 26 conditions and diseases covered don't amount to a comprehensive list, but common ones, such as HIV, heart disease, stroke, and STDs, are there. ▲

# BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.smartcomputing.com/cpumag/dec01/bios to see the entire upgrade list.

| Mfr | File/Date available | URL |
|---|---|---|
| ASUS | TUEG-VM BIOS version 1010 09/05/2001 | www.asus.com/products /Motherboard/bios_s370.html |
| ASUS | CUWE-RM BIOS version 1016 09/03/2001 | www.asus.com/products /Motherboard/bios_s370.html |
| ASUS | P4B BIOS version 1003 09/03/2001 | www.asus.com/products /Motherboard/bios_s478.html |
| Gateway | EA8A510A BIOS version P09 09/06/2001 | www.gateway.com/support/product /drivers/bios/ea8a510a.shtml |
| Gateway | Pentium 4 BIOS GB85010A version P13 09/17/2001 | www.gateway.com/support/product /drivers/bios/gb8501a.shtml |
| Gateway | Flash BIOS version 29.00 08/27/2001 | www.gateway.com/support/product /drivers/portable/9553.shtml |
| Gateway | Flash BIOS version 29.01 08/27/2001 | www.gateway.com/support/product /drivers/portable/9553.shtml |
| Toshiba | ACPI Flash BIOS version 1.04 11/02/2001 | www.csd.toshiba.com/cgi-bin /tais/su/su_sc_home.jsp |
| Toshiba | ACPI Flash BIOS version 1.07 12/06/2001 | www.csd.toshiba.com/cgi-bin /tais/su/su_sc_home.jsp |
| Toshiba | ACPI Flash BIOS version 1.07 12/06/2001 | www.csd.toshiba.com/cgi-bin / tais/su/su_sc_home.jsp |

Compiled by Russell Shaw

## You Get Paid For That?

If you missed your chance to be a rock star but still want to get paid for playing around all day, check out this job description we found on the BrassRing job site.

**Stafftopia,**
**Menlo Park, Calif.**
**Sound Technical Lead**

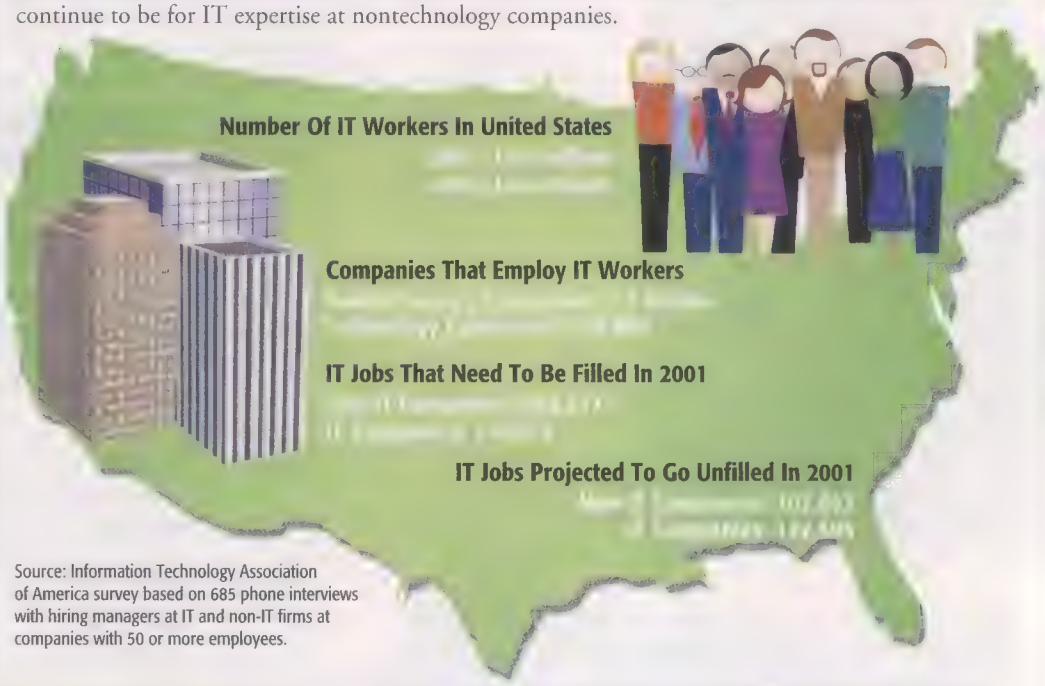
You may think your C++ duties are far removed from playing the types of computer games you enjoy while off duty, but that's not always the case. Would you believe you can put your C++ experience to use designing sound effects for those very games? Stafftopia is looking to place a person with "strong" C++ experience to "build the tools and interfaces to support sonifying highly interactive objects in a way that blends the needs of procedurally adjusting sound parameters according to a real-time simulation and the needs of enabling sound designers who are not programmers to craft interactive environments."

In other words, you'd be making the killer spaceship's shots across the bow of the peaceful explorer ship sound realistic and in time with the action.

Now that's a job.

## IT Jobs Still Have It

Despite the downturn in the information economy, hundreds of thousands of information technology jobs will need to be filled this year, with many going begging for want of qualified workers, reports the Information Technology Association of America. Most opportunities will continue to be for IT expertise at nontechnology companies.




Source: Information Technology Association of America survey based on 685 phone interviews with hiring managers at IT and non-IT firms at companies with 50 or more employees.

## Stay On Task

Does the recent slump in the economy have you worried? Concerned that becoming part of the next round of layoffs will cramp your upgrading style? As senior producer for the job site BrassRing, Sarah Jersild has her finger on the pulse of the IT employment market. She also writes the Career Coach column for *High Technology Careers*, a BrassRing publication distributed at job fairs the site conducts nationwide. Listen up as she explains how not to lose your job.

- Cross-train. Obtain certifications in other areas, including for what you were hired, as well as for what other people were hired. Security is especially hot right now; a certification such as Enterprise and Web Security Certified Professional can be vital. You can get a cert in 30 days, which qualifies you to work on such things as VPNs and Intrusion Detection.
- Gauge what skills your company will need in the future. Talk to the people who are putting together future-planning projects.
- Read about your company in the media. If, for example, a stock analyst that tracks your company is speculating your firm may expand its expertise, learn more about the possibilities.
- Make a list of your concrete accomplishments and commit them to memory. If your company merges with another, the acquiring company may conduct interviews with current personnel to see who can stay and who needs to go. You could be summoned to such a meeting with as little as 15 minutes lead time, so be ready to state your case.

by Alex St. John

# Why I Need A Steel Umbrella

*Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is president and CEO of WildTangent, a technology company devoted to delivering CD-ROM-quality entertainment content over the Web.*

I stand on the balcony of my office at WildTangent HQ overlooking the barren expanse of ruined technology companies that once shared our office park. A wet thud nearby indicates that the storm has not ended yet and bodies are still raining from the sky. Outside, our walls are besieged by recruiters waving resumes and screaming to be let in, but the gate is closed.

It was not so long ago that I was locked in mortal negotiations with the landlord to secure this space from half a dozen competing offers from newly founded dot-coms spending their newly minted VC capital. We had already been around for a year when the Internet boom peaked. On the last of our first round of funding we hardly stood a chance against the wave of Microsoft millionaires that were abandoning ship to start their own ventures. My best friend, also departing Microsoft, outbid me on office space I was desperately trying to secure . . . with *my* realtor!

We had 90 people piled on top of each other in 4,000sq/ft of space while I desperately searched for new accommodations. I offered stock options to neighboring small companies to give us their space, and they took them! I took over the warehouse for a small soccer ball importing company, had carpet thrown down, and Costco folding tables and chairs set up in long rows to house engineers.

We had interview candidates that would ordinarily be collecting beer cans for a living tell us that they had been offered 160K salaries and 5% of the company down the street and that they really wouldn't consider working for anybody who wouldn't let them work from home 50% of the time.

We had our own share of departing Microsoft folks join us, and periodically they received nasty letters from Microsoft lawyers warning them not to recruit their friends. Ah . . . but that was so long ago (well last year really), in the heyday of the Internet. Now I get asked to do speeches on how I survived the Internet crash, as though still being around is some miraculous achievement. I have to shrug and say, "I just didn't spend all the money they gave me."

During the peak of the madness, my EVP of Sales and I had a meeting with the CEO of a "leading entertainment portal." I suffer from the notion that people who run technology companies should know something about technology, but NOT SO in Hollywood. This guy wore a suit, looked professional, and was very eager to show us the incredibly spacious office space they were building out for the 250 people they would hire that year. Naturally, they had taken great pains to have it expertly decorated in order to have the faux start-up look, complete with exposed ductwork, and uncarpeted concrete floor . . . the new Aeron chairs were the only sure give away that it was all an expensive ruse. I was informed that although they had only been in business for six months and had not launched yet, they expected to do their second funding round at a quarter billion dollar valuation.

**. . . the Internet boom did not create a single new entrepreneur; it just created lots of high paying job opportunities for people who weren't entrepreneurs.**

It was quickly evident that there was no point in discussing how our technology could help his portal, because he had no idea what his portal was, or how the portal would work. Halfway through the meeting, their CEO realized that I was the CEO of WildTangent, and not an engineer that had tagged along to answer technical questions. It was then that I realized that the Internet boom did not create a single new entrepreneur; it just created lots of high paying job opportunities for people who weren't entrepreneurs.

His body and those of half a dozen other entertainment portals we had met with in L.A. had rained down early in the storm. Now it is raining harder and the bodies are getting bigger. Jobs at Microsoft are suddenly pretty coveted again. The topic of conversation in the WildTangent cafeteria is all about who got posted on F****dcompany.com today. I politely warn people not to feel too smug; I've seen where that attitude lands you. ■

*Direct your thoughts to TheSaint@cpumag.com.*

# EXTREME HARDWARE

## These Gizmos Don't Sing It, They Bring It

Let's face it, computer stuff on its own is as boring as lint. What's interesting is what you can *do* with that stuff.

Sometimes, visionaries (or nuts) are given free rein to do some pretty radical things with the latest technology. By its very nature, extreme hardware often falls outside of what you would normally consider to be computer gear, which is the whole idea. Without these brave souls pushing the envelope, you might have never been able to put your face into a video game or have a grand piano sing you to sleep.

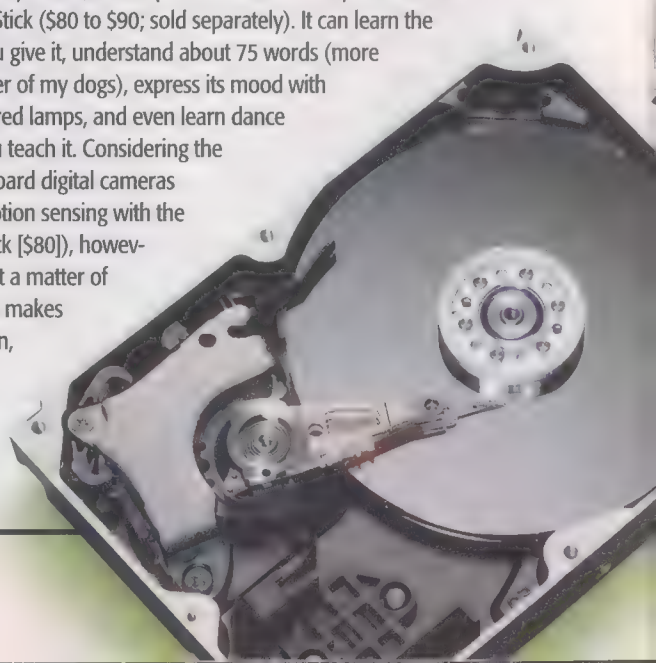
by Marty Sems

### Yamaha Disklavier Mark III Series

These aren't exactly new, but they're too weird to leave out. The Mark III Series of Yamaha's (www.yamaha.com) Disklavier grand pianos not only play by themselves, but some can even sing in accompaniment using special CDs. One of these babies can record what a student plays and then play it back note for note to help her learn. The Mark III Disklaviers start at about $31,000 and top out near $100,000.

### AIBO LM Series

"Do androids dream of electric not-necessarily dogs?" is something the late author Philip K. Dick might have asked. Until now, those of us without thirteen hundred bucks to drop on a Sony AIBO (www.us.aibo.com) could only dream, as well. Sony's new ERS-311 "Latte" and ERS-312 "Macaron" are more accessible at about $850 each. An AIBO develops a personality shaped in part on how you play with it, and in part on the software you feed it via Memory Stick ($80 to $90; sold separately). It can learn the name you give it, understand about 75 words (more than either of my dogs), express its mood with multicolored lamps, and even learn dance moves you teach it. Considering the AIBO's onboard digital cameras (including motion sensing with the Pal Memory Stick [$80]), however, it's probably just a matter of time before Hollywood makes an electric pet B-movie villain, à la Chucky.



## SYS Cold-Fusion

AMD fans love their chips, but it chafes them to see 2GHz Intel P4s everywhere when the Athlon currently tops out at 1.53GHz. (Yes, clock speed doesn't equal performance; I'm not going there.) Fanatics with big bankrolls can turn to "thermally-accelerated" systems using Kryotech (www.kryotech.com) active cooling systems. One example is the SYS Cold-Fusion PC with an Athlon running at 1.86GHz ($3,488; www.sys.com; speakers shown here are no longer available). Kryotech is back after a hiatus, providing the SuperG2 refrigeration unit in the base of the Cold-Fusion's case to keep the Athlon stable. Rumor has it an Athlon XP version will be available as you read this. (See our Athlon XP review on page 30.)

## Kodak DCS Pro Back Plus

Five- and 6-megapixel digital cameras are overkill for most consumers, but pros need more horsepower. Much more. For a pittance $21,995, you can turn your medium-format film camera with an electronic shutter into a 16-megapixel (4,080 x 4,080) digital camera by attaching Kodak's DCS Pro Back Plus (www.kodak.com). This high of resolution creates mammoth files—up to 48MB per photo, Kodak says—so you'll appreciate the DCS Pro Back Plus's PC Card storage slot and IEEE 1394 interface.

## Maxtor DiamondMax D540X 160GB

Bigger is better. Really big is really better. Try 160GB in a single, low-profile UltraATA/133 hard drive with Maxtor's DiamondMax D540X ($399.95; www.maxtor.com; 80GB model shown). Meanwhile, Seagate's 181GB Barracuda 180 ($1,800; www.seagate.com) still rules in SCSI capacity, while the company's Cheetah X15-36LP ($699) lived up to its name in our tests. If a 61.2MBps feral feline such as this Cheetah doesn't stoke your chimney, you probably should subscribe to another magazine. *Cat Fancy*, perhaps?

## Picture Paradise

Gamers have been going gaga over the special "clone generator" booths 3Q (www.3Q.com) makes for just about a year now. For about $15, a booth can take a 3-D picture of your face from three angles and turn it into a skin you can use for your character in such games as Quake III Arena and Unreal Tournament. Leave it to Sony (www.sonystyle.com; www.scea.com) to bring this cool tech to the home so you can personalize your PlayStation 2 playtime with Picture Paradise technology.

The Picture Paradise setup requires that you have a Sony Cybershot digital camera ($249.95 to $999.95) and a PS2 ($299.99), naturally. You'll also need a Picture Paradise-compatible game. These have been available in Japan for a while, but the only such game in the United States at this writing is Tecmo's Monster Rancher 3 ($49.99; www.tecmoinc.com). Just shoot your face with the Cybershot, connect the camera to the PS2 via USB, and slap your face on your game character. The awesome part is that the Picture Paradise game I played at TECHX-NY in June could map a seamless 3-D character face from a single 2-D digital still.



Graphics & Design: Carrie Benes


# NVIDIA GeForce3 Titanium Series

The GeForce3 chip has been turning heads on 3-D gaming runways for the past six months. With DirectX 8 hardware features, spiffed up memory architecture, programmable everything, and speed to spare, the only unfortunate snag, at least until now, has been price.

Introduced in April at a whopping $500, GeForce3 boards sold about as expected, but six months (at press time) on, how does NVIDIA see the future? Already busting out all its stops with the imminent release of some box marked X, playing happily in the mobile market with GeForce2Go, and gearing up for an assault on the motherboard chipset industry with its nForce, you might think NVIDIA would forgo the six-month hard core gamer product cycle refresh and take a time out. Of course if you did think that, you'd be wrong.


GeForce3 Ti 500

*The new speed king but still a bit pricey.*


GeForce3 Ti 200

*Great bang for your buck in terms of price and performance.*


GeForce2 Ti

*Nothing new here other than a name and a slight price drop.*

NVIDIA's Titanium fall collection represents dynamite marketing with some great trickle-down effects. The Ti series is based upon an updated version of TSMC's 0.15-micron manufacturing process, resulting in improved yields at higher clock rates. The unveiling of yet another speed king in the GeForce3 Ti 500, with its super fast 3.5ns EMS DDR memory, will allow for attractively priced introductions for the GeForce3 Ti 200 and GeForce2 Ti. Detonator XP drivers will unlock a few new features (shadow buffers and 3D textures) from the GF3 hardware and may even improve performance for older NVIDIA-based accelerators.

**New features.** The **shadow buffer** is a hardware technique for rendering physically correct shadows using texture filtering. A shadow map is created from the perspective of the light source and stored like a texture for reference in the shadow buffer. When the scene is rendered from the eye point perspective, a lookup table Z comparison is done to see which visible pixels should get shadow information. The improvements over existing shadow techniques available on consumer gear include shadowing of complex scenes, soft-edged shadows, and "self-shadowing," where part of an object can cast a shadow on itself.

Unfortunately, the stored shadow maps come in big sizes, and boards with "only" 64MB of memory probably won't live well with this. However, John Carmack has hinted that id Software could be implementing this feature into Doom III. (So if those floating, rotten, red tomatoes, known as Cacodemons, make a comeback, they will do so trailing some super-fabby shadows.) Using this technique is really only practical if the light doesn't move.

The other new feature implementation, **3D textures**, contains texture information in three dimensions, as opposed to two. Traditional 2D textures can only describe the surface of an object, but 3D textures can also define its interior with properties such as wood grain. Areas that 3D textures may practically be used are volumetric fog and procedural textures for explosions, lighting, or plasma effects. And choppable trees, of course. 3D texture compression, available through DirectX 8, realizes an 8:1 compression ratio, but again, this feature is taxing.

Doom III aside, exactly when and to what extent these features will be implemented in games of the future is anyone's guess. If you go by NVIDIA's list, there should be a few over the coming months. Historically, though, features such as texture compression, bump mapping, and T&L have taken the game industry a long time to adopt. The same is likely for 3D textures and shadow buffers, but they are great new buzzwords.

So let's meet the Titanium Family. The "We Are Family" table below details NVIDIA's Titanium line, incidentally, marking the first time they have branded a full season of hardware from the get-go. Each has four rendering pipelines; two texture units per pipeline, and 64MB of DDR memory.

## We Are Family

| | GeForce2 Ti | GeForce3 Ti 200 | GeForce3 Ti 500 |
|---|---|---|---|
| Core Speed | 250MHz | 175MHz | 240MHz |
| Memory Speed | 460MHz | 400MHz | 515MHz |
| Bandwidth | 6.36 GBps | 6.4 GBps | 8.0 GBps |
| Transistors | 25million | 57million | 57million |
| Process | 0.18-micron | 0.15-micron | 0.15-micron |
| NSRP* | $149 | $249 | $399 |

*NVIDIA Suggested Retail Price

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

The GeForce3 Ti parts are based upon the same 0.15-micron NV20 chip as the GeForce3, so you can count on the same nfiniteFX engine with HRAA Quincunx, programmable pixel and vertex shaders, Lightspeed Memory Architecture, and DirectX 8 features as earlier boards. The GeForce2 Ti is based upon NV15 using NSR, so the same does not apply. This also indicates that the next-generation NV25 graphics core has been pushed back to 2002, if we are to go by the usual NVIDIA six-month cycle. Considering the current economic climate, this is probably a good move for NVIDIA; game developers haven't exactly been pushing the new features envelope anyway.

**Benchmarks.** The benchmarks I ran on a Pentium 4 2GHz Windows 2000 system using Detonator XP 21.85 drivers yielded performance boosts at higher resolutions for the Ti 500 in 3DMark2001, DroneZ, Quake III, and Max Payne. Its increased clock speed and memory bandwidth dished out the goods at 1,280 x 1,024 and 1,600 x 1,200. Quake III 1,600 x 1,200, with all features on, yielded an impressive 104.8fps. That is top draw in my book, and investing in a 19+-inch monitor now makes sense. The Ti 500 was 10% faster at 1,024 x 768 and 15% faster at 1,600 x 1,200 than the GeForce3.

Though the Ti 200 falls behind the original GeForce3 at high resolutions, NVIDIA is introducing it at half the GF3's original price. The GeForce2 Ti tested on par with a GeForce2 Pro but lagged behind the GF2 Ultra.

**Overclocking.** Of course, overclocking a Ti 500 isn't the best way to treat an expensive BRG (British Racing Green) 3-D card and tends to void the manufacturer's warranty, but if you fancy making an "Ultra" out of your Titanium, Registry tweaking ekes out more performance. I got the core up to 270MHz and the memory up to 590MHz all in the name of fun with up to a 4% performance gain at best.

Performance-hungry bargain hunters could look for reduced-price GeForce3 cards in the short term before they are phased out. Otherwise, the Ti 200 is almost on par with the original GeForce3 and outperforms a similarly priced ATI Radeon 7500, making it the quintessential game board for budget-conscious fraggers. The GeForce2 Ti doesn't rev my engine because I'm always driving on the bleeding edge in the rather expensive fast lane and looks like being a GeForce2 Pro with a fancy name. But like the budgie, it goes "cheap."

Sooner rather than later, you're going to need a bigger boat if you intend to run Windows XP with Direct X 8.1. OK Neo, are you going to take the red pill and see a 10% performance gain and maybe some rather nifty features in games, such as Aquanox and DroneZ, with Ti 500? If you already have a GeForce3, take the blue pill instead. You'll wake up forgetting you ever read about Ti 500 and still enjoy games such as Doom III in six months but with slightly less speed.

Previously, if you wanted to play apex games, you had to have an expensive 3-D card. But now with Xbox and GameCube (ironically using NVIDIA and ATI chips, respectively), what's to stop a PC gamer, already happy with his GeForce2/3, opting to "console" himself out of the upgrade dilemma?

Plus, there is still competition from up North (blame Canada!), where ATI has been chipping away. On paper at least, the Radeon 8500 seems to be shooting at the Ti 500, thanks to some last-minute progress. It has a 275MHz core clock, 550MHz 64MB DDR RAM, coupled with a $299 MSRP, and should give ATI a chance to catch up. Has NVIDIA left the door open by not releasing the NV25 chip, instead opting to overclock the NV20? Or will ATI's track record of delivery delays stall them again? The proof will be in the pudding this Christmas.

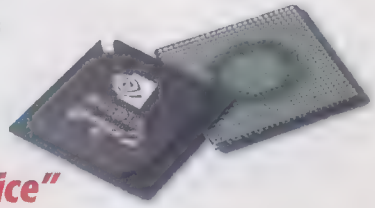
**If it ain't broke, don't fix it.** Just overclock, rename, and lower the price. That should satisfy shareholders, retailers, game developers, and us humble consumers, thank you very much. Ti products from ELSA, Hercules, and the others should be out by the time you read this. ▲

**by Alex "Sharky" Ross**

**"Overclock, rename, and lower the price"**

## GeForce Benchmarks

| 3DMark2001 | 1,024 x 768 | 1,600 x 1,200 |
|---|---|---|
| GeForce3 Ti 500 | 7613 | 5194 |
| GeForce3 Ti 200 | 6326 | 3902 |
| GeForce3 | 6850 | 4439 |
| Geforce 2 Ti | 4071 | 2216 |
| GeForce2 Ultra | 4363 | 2494 |
| **Max Payne** | **1,024 x 768** | **1,600 x 1,200** |
| GeForce3 Ti 500 | 79.4fps | 53.6fps |
| GeForce3 | 69.2 | 45 |
| Geforce 3 Ti 200 | 68.2 | 44.9 |
| GeForce2 Ti | 53.5 | 27 |
| GeForce2 Ultra | 65.1 | 39.5 |
| **Quake III - MAX** | **1,024 x 768** | **1,600 x 1,200** |
| GeForce3 Ti 500 | 199.3fps | 104.8fps |
| GeForce3 Ti 200 | 160.5 | 77.3 |
| Geforce 3 | 179.4 | 88.9 |
| GeForce 2 Ti | 110.4 | 49.2 |
| GeForce2 Ultra | 124.8 | 56.3 |
| **DroneZMark** | **1,024 x 768** | **1,600 x 1,200** |
| Ti 500 NO FSAA | 117.6fps | 75.1fps |
| Ti 500 Quincunx | 69.7 | 33.1 |



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Microsoft Office Keyboard

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(425) 882-8080
www.microsoft.com

The Office Keyboard is the latest keyboard to come from Microsoft's hardware division. It is one of an ongoing series of keyboards designed to simplify common tasks and ease up on carpel tunnel-inducing wrist movements. Although the Office Keyboard is about one and a half times larger than my good old basic IBM keyboard, I liked that it includes a wrist rest (although a soft one would have been nicer) and an application-launching command center across the top.

As soon as I noticed that Microsoft relocated the INSERT key away from the DELETE key, thus reducing the chance of accidentally pressing it and messing up my typing, I began to get a warm feeling inside. It was the scroll bar on the left side of the keyboard, though, that seduced me into enjoying the rest of the keyboard's features.

Sure, there are some features that I find a bit goofy, such as buttons for Cut, Copy, and Paste, but that's probably because I'm so used to using the CTRL-X, CTRL-C, and CTRL-V commands to get those jobs done. Overall, though, the features are delightfully useful, evidence of the hundreds of usability testing hours Microsoft put in to make sure the Office Keyboard would meet the needs of most users.

The keyboard's features include new uses for the *F* keys, spelled out on each key. For example, F7, F8, and F9 are e-mail functions that let you reply, forward, and send e-mail, respectively. If you're an old-fashioned *F* key user, press F Lock to regain the *F* key features you know and love.

If you've read this far, you're probably not hell-bent on buying a fancier, ergonomic-split keyboard or wireless keyboard and mouse. If that's true, but you do want to upgrade your keyboard, you might just fall in love with this one. In fact, I think I'll use this keyboard at my desk for as long as I can get away with it. ▲

**by Cal Clinchard**

# Logitech Cordless Freedom iTouch

**Cordless Freedom iTouch**
$79.95
Logitech
(800) 231-7717
(510) 795-8500
www.logitech.com

I've never come across a Logitech keyboard or mouse I didn't like, and the Cordless Freedom iTouch Keyboard and its partner, the Cordless Mouse, are no exception. The keyboard and mouse combo included software on CD, batteries, and the necessary cables. The combo runs on Windows 98/NT/2000/Me, and the receiver plugs into an available USB port or two PS/2 ports (one for the keyboard, one for the mouse).

The devices use RF technology and a 12-bit digital secure ID code; they run at 27MHz, so interference issues are practically zilch. I tested the combo in our lab, which is crowded with running equipment, and had no problem using the keyboard and mouse from any location with different obstacles between the receiver and myself.

If you're always using a PC at a desk, the Cordless Freedom iTouch will, of course, remove the hindrance of cords and reduce the risk of coffee spills; beyond that, however, you won't gain much from its wireless capabilities. But if, like me, you spend most of the workday sitting in front of a PC, you want a chance to move around a bit once you get home, and for that wireless is nice. And new college students take note: The Cordless Freedom iTouch is fantastic if you don't have any furniture, although you'll probably have to spring for a mouse pad if you don't have hard, smooth floors.

The keyboard has hot keys across the top for one-touch access to your e-mail account (Outlook Express is the default), financial application, media player controls, and certain browser controls. This keyboard doesn't have the added Internet functions (including a scroll wheel) that Logitech's Internet Navigator keyboard or Cordless Freedom Optical keyboard and mouse have, so you might want to check those out before buying the Freedom iTouch. For $79.95, this combo is competitively priced, and it's comfy for lefties and righties alike. ▲

**by Cal Clinchard**

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

INTRODUCING

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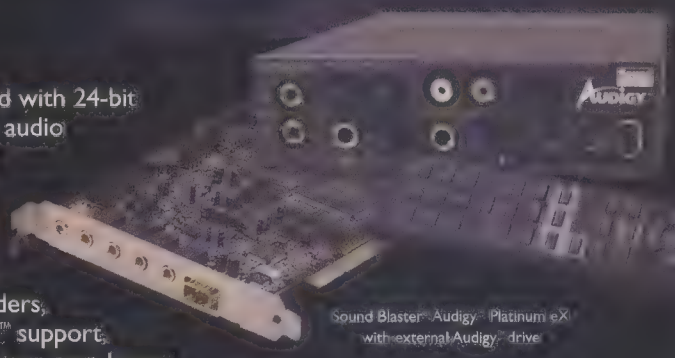

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CREATIVE

# Matrox Millennium G550

The Matrox Millennium G550 isn't a glamorous video card, at least not in the same sense that NVIDIA GeForce3 or ATI Radeon cards are glamorous. Those cards are for games, so they receive lots of attention. The Millennium G550 was designed for a larger, nongaming audience. It has superior 2-D acceleration, a low sticker price, and a unique HeadCasting engine you can use to animate a 3-D version of your own head for online communications.

The Millennium G550 is an AGP 2X/4X video card with 32MB of DDR SDRAM. It has a maximum resolution of 2,048 x 1,536, which should be more than enough for most users. The card's refresh rates range from 85Hz to 200Hz, so you shouldn't have to worry about screen flicker even at the highest resolutions. The G550 is compatible with Win98/NT/Me/2000/XP.

The thing that impresses me the most about the Millennium G550 (and also with past Matrox video cards) is its 2-D acceleration. The card's overall SYSmark2001 score was 67, which is as fast or faster than the latest ATI Radeon and GeForce3-based cards I've reviewed. The Office Productivity score of 58 is good, and the card's Content Creation score of 78 is also solid.

The Millennium G550's weakness is 3-D video, but it's not intended to be a 3-D graphics monster. I played several rounds of Quake III at a resolution of 800 x 600, and the game was playable, but it slowed down several times. The card's frame rate was 46.5fps at 800 x 600 and was a serviceable 32.9fps at a resolution of 1,024 x 768. But these scores can't compare to the numbers GeForce3 and ATI 3-D graphics cards are capable of. The G550's 3DMark2001 score of only 629 underscores this card's 3-D deficiency.

I think the Millennium G550 is a high-quality card that will appeal to many users. The Millennium G550 can provide all the 2-D acceleration any user could want, and it's much cheaper than more powerful 3-D cards. ▲

**by Michael Sweet**


**Millennium G550**
$125
Matrox
(800) 361-1408
(514) 822-6000
www.matrox.com

CPU CPU CPU CPU

# HP Scanjet 5490c

The HP Scanjet 5490c is an easy-to-use flatbed scanner with results that don't require much adjusting. Even novices will find it easy to use. But I think its features make this model perfect for an office or professional user who needs to do more than e-mail pictures.

The 5490c has USB and parallel interface connections with a 2,400dpi optical resolution and 48-bit color depth. The Scanjet 5490c's features include a lighted transparency adapter for negatives and slides, eight one-touch buttons (copy, scan, e-mail, share-to-Web, power save, photo reprint, options, and cancel), and a 25-page automatic document feeder.

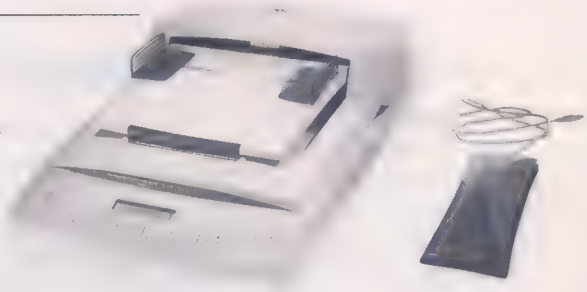
The scanner's software includes HP Precision Scan Pro 3.1, Acrobat Reader 4.05, HP Photo Printing Software, Corel Print Office 2000, ACDSee, eFax Messenger Service, NetObjects Fusion, and ScanSoft Paper Port Deluxe.

Scan times ranged from 39 seconds to 2:24 (minutes:seconds) at 600dpi and 2:21 to 11:22 at 1,200dpi. The results were clean and sharp, often comparable to the original photos. Colors were bright, and details in texture and contrast, such as shadow areas and natural-looking hair and flesh tones,were evident. A black-and-white scan looked smooth and also had sharp contrast and detail. A text scan had good ink coverage. The grayscale test picked up 25 shades of gray, only two away from our 27-shade benchmark average.

You likely won't need to make many adjustments to the scans, but you can use the guided steps or select Advanced Adjustments from the software's pull-down menu to alter resolution, highlights, midtones, and shadows.

The ADF works fine, as does the transparency adapter. The users guide gives clear instructions on how to use these features. I like this $399 scanner, but as I said, if you don't need its options, you are better off looking at something simpler. ▲

**by Catherine Geistkemper**



**Scanjet 5490c**
$399.99
Hewlett-Packard
(800) 752-0900
(208) 323-2551
www.hp.com

CPU CPU CPU

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

# IBM T540

**T540**
$539
IBM
(800) 426-4968
(914) 765-1900
www.ibm.com

It's getting increasingly difficult to find a bad 15-inch LCD. Great looking, reasonably priced 15-inch LCDs seem to be rolling off the factory lines faster than we can get our hands on them. The T540 from IBM is no exception, and it easily ranks among the best in its class.

The T540 is an analog-only model with a maximum resolution of 1,024 x 768 and a 75Hz refresh rate. These specs don't compare with, say, the typical 17-inch LCD with dual (analog and digital) input and a 1,600 x 1,200 maximum resolution, and the T540 doesn't come with many extras. But that's OK for a bargain-priced LCD.

Our lab technicians installed the T540 on our 500MHz Pentium III VIA system, which uses an NVIDIA GeForce2 GTS video card. I tested the display at the maximum resolution and refresh rate. The T540 performed flawlessly during most of our diagnostic tests. The screen that tests for defocusing revealed no blooming or halo effects, which is notable because with even the best displays, there is often some minor blooming. Scaled fonts looked clear and sharp; the smallest fonts were readable and not the least bit fuzzy.

All color combinations looked excellent, and the 256 intensity level ramps showed vivid color and a healthy range of light to dark. During the extreme grayscale tests, I noticed a tendency toward over-darkness, but this wasn't apparent elsewhere. The screen that tests for white-level regulation, which also illuminates tiny problems in the best of displays, looked perfect on the T540. The thinnest white lines against a dark background looked absolutely white, without the typical tendency toward gray.

I looked at a Microsoft Word document and an Excel spreadsheet; the text in both cases was nice and sharp. The T540 would make an excellent choice for any imaging task. This LCD is a bit more expensive than the growing number of sub-$500 models, but for the quality it provides, you won't regret paying a few dollars more. ▲

**by Cal Clinchard**

# Sony SDM-N80

**SDM-N80**
$1,699
Sony Electronics
(800) 476-6972
(201) 930-1000
www.sonystyle.com

OK, anyone who doesn't want the best 18.1-inch multimedia LCD going, clear the room. Now all you who are left have to do is come up with $1,699. Unless you're a graphics professional, a 3-D gamer with an addictive personality, or just plain loaded, you probably won't want to afford Sony's SDM-N80 display.

If you are broken-hearted about the price but desperately seeking a new LCD, explore the 15-inch category. There are a slew of fantastic yet cheap 15-inch LCDs, many of which have better graphics capabilities than the SDM-N80. If size is what counts, you might be disappointed to find that large-screen LCDs aren't perfect.

But let me repeat: The SDM-N80 is the best 18.1-inch LCD around. It has a few troubles, all of which are common to most large-screen LCDs. Tests for video bandwidth and brightness revealed limitations that affect high-detail clarity and text presentation, but to a lesser degree than other 17-inch and 18-inch LCDs. But in practical use, looking at Microsoft Word documents and Excel spreadsheets, the SDM-N80 performed nicely at all font sizes above size 8.

After examining focus matrices designed to highlight flaws in even the best of monitors, I wished the SDM-N80 could have done better. On the other hand, only the most finicky users will notice any lack of clarity in ultra-fine details. And if you're looking for great color, most LCDs (forget about size) can't touch the SDM-N80. What's more, it has a 350:1 contrast ratio and a 1,600 x 1,200 maximum resolution.

Beyond its imaging capabilities, the SDM-N80 is all about features. It sports built-in stereo speakers, dual analog/digital input (DVI-I cable included, DVI-D not included), and two USB ports. It also includes a 3.3-pound media engine, which accepts audio, video, and USB and uses a single cable to carry data and power to the display. Without a doubt, power users will find a lot to love about the SDM-N80. ▲

**by Cal Clinchard**

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# HP Deskjet 845c

I've seen some outstanding low-cost inkjets lately, most notably Lexmark's Z43 and Canon's S300 (both $99). HP's riposte is the Deskjet 845c, company-rated at 8ppm in color and 5ppm in black and white. The printer produces a maximum resolution of 600 x 1,200 dpi when using photo paper, and following the current trend, supplies only USB connectivity.

With the 845c being the last printer I reviewed in the sub-$100 price range, it did little to stoke my admiration, riding the middle of the road between quality and cost. But this isn't always a bad place for a printer to be.

I rated a 10-page plain-text file at 5.2ppm, a six-page Word document with both text and graphics at 1ppm, and three pages of PowerPoint slides at 1.42ppm. All three times were flat-out average. A full-page photo was the biggest drag; on plain paper the 845c needed nearly six minutes to complete the photo, and the photo-paper image took more than 16 minutes to finish.

Text quality is worse than average. There were too many stair-stepped characters and warped lines of text, and the inks were too light. Clip-art graphics looked good, as they were devoid of banding and full of accurate coloring. Solid black areas on the PowerPoint slides were smooth, but like text, they could have been much darker.

The 845c's standout trait is its handling of high-res photos. Unlike many economical inkjets, there are no weirdly slanted colors on either plain or glossy paper. That leaves you with a tough choice: Buy a much faster printer (such as the S300) and sacrifice some quality, or mow the lawn while you wait for the 845c to finish a job.

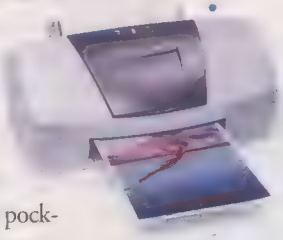
If you decide on the 845c, you'll be making a sound economic choice. Black cartridges cost $30, and the tri-color cartridge is $33. On a per-page basis, black costs about 6.1 cents, while color runs approximately 7.7 cents. ▲

**by Nathan Chandler**

**Deskjet 845c**
$99.99
Hewlett-Packard
(800) 613-2222
(650) 857-1501
www.hp.com

CPU CPU CPU

# Canon S630



Canon's S600 set high new standards for this company's line of inkjets. The follow-up, the S630, did even more to impress me. The new printer features a speedier print engine inside.

The S630 prints at a maximum resolution of 2,400 x 1,200 (600 x 600 for text). Ink droplets have a volume of only about 5 picoliters, perfect for fine detail on even complex photos. And according to Canon's specs, this printer boasts 17ppm in black and white and 12ppm in color.

I've found Canon's speed claims to be more exaggerated than other companies, and the S630 is no exception. Even at the custom draft setting we selected (lower even than Canon's default draft mode), we only managed to squeeze 8ppm out of a 10-page text file. At that level, text was noticeably lighter and fuzzier than Canon's default mode and approached dot-matrix quality.

The S630 took only 4:24 (1.36ppm) to print a six-page text and graphics file. The results boasted solid black text and accurate graphics color.

Full-color photos printed on 8.5 x 11 paper at maximum resolution are also much faster on the S630, taking just a little more than seven minutes to print. The first photo was printed on Canon's in-house inkjet paper, and it was drop-dead gorgeous, with vivid reds, bright yellows, and well-shaded dark areas. However, a few tiny pockmarks that tarnished the photo were annoying when viewing the photo at an angle.

The biggest print-quality complaint is with solid black graphical elements. Not only does the S630 refuse to evenly distribute black ink, but I also noted some ugly streaking on PowerPoint slides. At Canon's insistence, we tried a second test unit. That did the trick; streaking disappeared completely. PowerPoint slides printed at 2.17ppm.

With its boosted print speeds and consistently high quality output, the S630 keeps Canon on top of the inkjet pile at this price point. ▲

**by Nathan Chandler**

**S630**
$199
Canon
(800) 385-2155
(714) 438-3000
www.usa.canon.com

CPU CPU CPU CPU CPU

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

# Nikon CoolPix 995

**CoolPix 995**
$900
Nikon
(800) 526-4566
(516) 547-4200
www.nikonusa.com

The Nikon CoolPix 995 is bigger and bulkier than its peers, but you'll notice some impressive bulk in its roster of advanced options, too. A *50-step* manual setup provides ultimate individual control.

This 3.34-megapixel camera features 4X optical and 4X digital zoom. The bundled 16MB CompactFlash card stores 229 lowest-quality images. You can store one image at the lowest compression and maximum resolution (2,048 x 1,538). The Quick Play button creates a preview thumbnail in the corner of the LCD; press it again to see full-size images.

A Li-Ion battery provides longer battery life than the four AAs that powered the CoolPix 990. Also, a new flash location corrects the red-eye problems that plagued the earlier model.

As one of the best cameras on the market, the 995 will be a dream come true for many, but I thought it illogical that adjusting the resolution requires reaching two controls, one at the top and one at the bottom of the large camera, at the same time with the same hand. For my small hands, the awkward stretch caused me to miss a high-res close-up of a butterfly on a flower.

It would have been an incredible picture: This camera's macro mode is unmatched. Focusing in macro mode took patience but was a fair trade for the unbelievable, nearly microscopic close-ups. Other images were exceptional, with my only complaint being auto mode, where both the white balance and saturation were off. With the line-up of manual controls, though, this may not be a concern at all.

This is not the camera for an amateur because there's a lot to learn, and the menus aren't always intuitive. For those more comfortable with digital photography, though, this camera provides more individual control than any camera I've seen. And if it's quality close-ups you seek, look no further. Macro mode just doesn't get any better than with the CoolPix 995. ▲

**by Kylee Dickey**

# Canon PowerShot S300 Digital Elph

**PowerShot S300 Digital Elph**
$699
Canon
(800) 652-2666
(714) 438-3000
www.powershot.com

The PowerShot S300 Digital Elph is easy to operate and sturdy enough to tote almost anywhere, and it produces good images.

At just 2.5 inches high x 3.7 inches wide x 1.2 inches deep, this 2.1-megapixel camera will literally fit into the palm of your hand. The controls are all easy to reach, and most buttons are below the LCD, ensuring easy menu navigation.

That easy operation is a good thing because the users guide rarely provided quick reference. But even though instructions weren't always clear, the camera is so simple that once you start using it, you'll rarely need the manual again.

At the maximum resolution of 1,600 x 1,200 pixels and the lowest compression, the bundled 8MB CompactFlash card stores seven pictures. At the lowest-quality settings, you can store 85 images. Reviewing and deleting images is simple and so is marking images you want protected from accidental deletion.

A Li-Ion battery powers the camera, which comes with a battery charger. Charge time is only about two hours.

With 3X optical and 2.5X digital zoom and a focus range from 6.3 inches (in macro mode) to infinity (in normal mode), this camera can handle a relatively wide range of distances. The PowerShot S300 features Continuous and Panoramic shooting modes. Red-Eye Reduction and Slow-Synchro are available in addition to Auto Flash.

The picture quality is very impressive compared to other 2.1-megapixel cameras. Both indoor and outdoor images were sharp, and the macro image was well focused with vibrant colors. The tiny flash is powerful, lighting reasonably close images, even well after sunset.

The Canon PowerShot S300 Digital Elph is an excellent option for the novice, but it should appeal to anyone looking for something sturdy and portable, yet capable of producing quality images. ▲

**by Kylee Dickey**

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Yamaha RP-U200


PCs have become sophisticated audio machines that can do just about anything a home theater system can do—except receive radio signals. Sure, you can listen to a radio station over your network connection, but more often than not, the quality isn't good. With the Yamaha RP-U200 PC digital receiver, you can tune into your favorite local radio stations, but this device does a lot more than that.

The RP-U200 is an external USB device that contains its own digital signal processor. Basically, it's a USB sound card in a box. It also has several connections for various external audio devices. You can connect a CD player, tape deck, or other home audio component to it and play the audio through your PC. The RP-U200 includes a software program with which you tune in to radio stations and control the unit. I used the RP-U200 to tune in to several local stations, and it worked well.

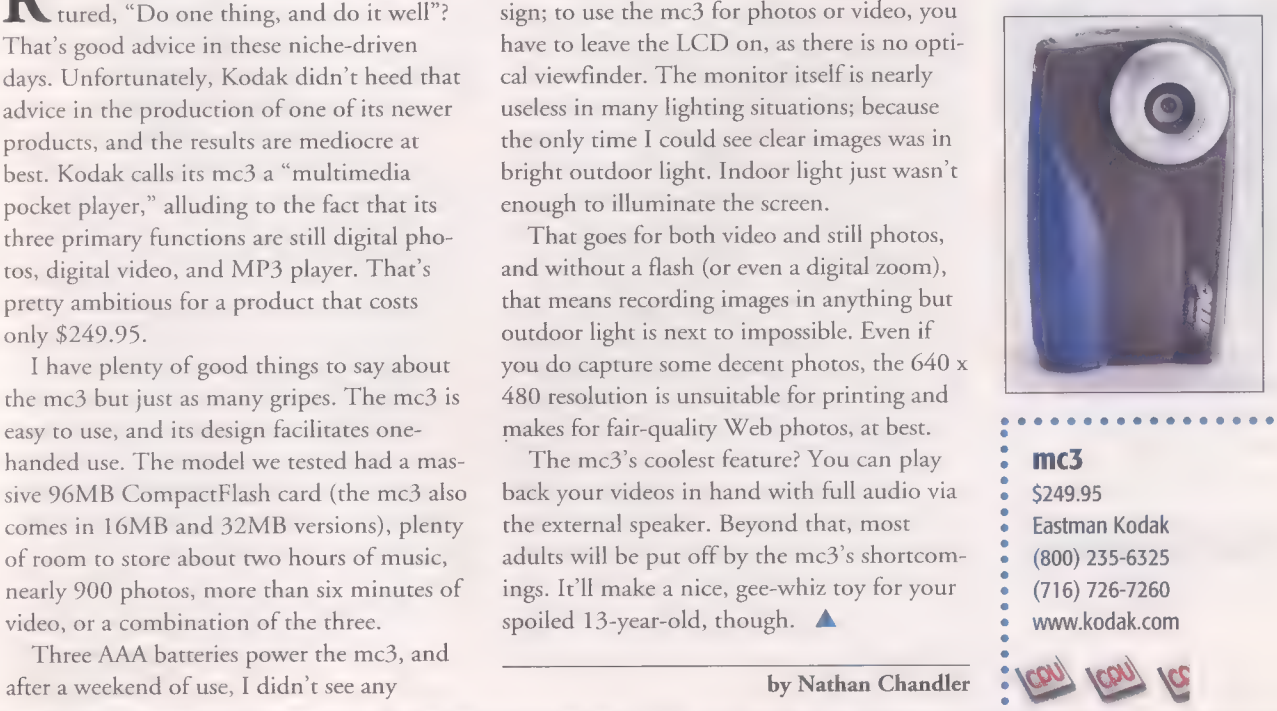
One of the things I think is curious about the RP-U200 is that it doesn't use PC speakers. Rather, you connect normal stereo speakers to it using the more traditional "clip-style" terminals found in many home theater setups. The RP-U200 has terminals for front left and right speakers, rear left and right speakers, and a center channel. There is also a subwoofer output, optical outputs, and a headphones output. The RP-U200 supports both DTS and Dolby Digital 5.1 sound. The RP-U200 serves up 14 rms (root mean square) watts per channel, which is about right for PC audio.

I played a few CD audio tracks through the system once the RP-U200 was installed, and I played a few rounds of Half-Life to boot. The audio CDs sounded really good, but the game's audio wasn't as lively as it was through the original Sound Blaster Live! Platinum sound card. The RP-U200's 3-D audio during the game was fine, though.

The Yamaha RP-U200 definitely isn't a peripheral for everyone, but if you're trying to create a home theater through your PC, you'll want to check it out. ▲

**by Michael Sweet**

**RP-U200**
$449
Yamaha
(888) 435-7932
(714) 522-9011
www.yamaha.com



# Kodak mc3

Remember the TV commercial that lectured, "Do one thing, and do it well"? That's good advice in these niche-driven days. Unfortunately, Kodak didn't heed that advice in the production of one of its newer products, and the results are mediocre at best. Kodak calls its mc3 a "multimedia pocket player," alluding to the fact that its three primary functions are still digital photos, digital video, and MP3 player. That's pretty ambitious for a product that costs only $249.95.

I have plenty of good things to say about the mc3 but just as many gripes. The mc3 is easy to use, and its design facilitates one-handed use. The model we tested had a massive 96MB CompactFlash card (the mc3 also comes in 16MB and 32MB versions), plenty of room to store about two hours of music, nearly 900 photos, more than six minutes of video, or a combination of the three.

Three AAA batteries power the mc3, and after a weekend of use, I didn't see any noticeable battery drain. This was a good sign; to use the mc3 for photos or video, you have to leave the LCD on, as there is no optical viewfinder. The monitor itself is nearly useless in many lighting situations; because the only time I could see clear images was in bright outdoor light. Indoor light just wasn't enough to illuminate the screen.

That goes for both video and still photos, and without a flash (or even a digital zoom), that means recording images in anything but outdoor light is next to impossible. Even if you do capture some decent photos, the 640 x 480 resolution is unsuitable for printing and makes for fair-quality Web photos, at best.

The mc3's coolest feature? You can play back your videos in hand with full audio via the external speaker. Beyond that, most adults will be put off by the mc3's shortcomings. It'll make a nice, gee-whiz toy for your spoiled 13-year-old, though. ▲

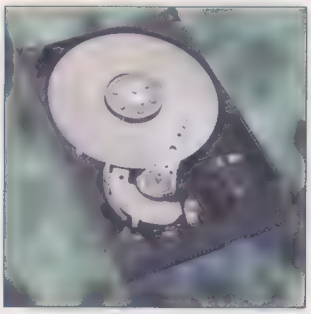
**by Nathan Chandler**

**mc3**
$249.95
Eastman Kodak
(800) 235-6325
(716) 726-7260
www.kodak.com



CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Seagate Barracuda ATA IV 80GB



**Barracuda ATA IV 80GB**
$250
Seagate
(800) 732-4283
(831) 438-6550
www.seagate.com

The new 80GB Barracuda ATA IV from Seagate has many modern features I like in a hard drive. It's an advanced storage unit that's dense, quiet, and tough. But it didn't quite live up to Seagate's billing of "the fastest PC hard drive ever" under HD Tach 2.61.

It's no small feat to pack 80GB of storage into two hard drive platters, but Seagate does it with an amazing areal density of 31.3 gigabits per square inch. Fewer platters mean lower cost and potentially higher reliability.

Another buzzword in hard drives today is acoustics. Barracuda ATA IVs all come standard with SoftSonic fluid dynamic bearing motors. These not only help motors last longer and run cooler, but they also help them run almost noiselessly. The 80GB unit we tested was virtually silent with a 24dB idle noise rating. Seagate says it varies from 28dB to 33dB while seeking, depending upon whether it's going for low noise or high performance. The single-platter 40GB and 20GB Barracuda ATA IVs are even quieter with 20dB idle ratings (24dB to 30dB during seeks).

This Barracuda has a 2MB cache buffer, a 7,200rpm spindle speed, and support for UltraATA/100. Its speeds are very good, if not chart-topping. Its maximum read speed, 42.8MBps, is second only to Western Digital's Caviar WD1000BB 100GB among EIDE drives we've tested.

The drive's average read rate was 36.4MBps; its average write rate, 19.2MBps. Its 14.5ms random-access time and 9ms advertised read seek time fell slightly behind our top EIDE drives. We tested it on a 600MHz Pentium III PC with 128MB of RAM, WinMe, and HD Tach 2.61.

This Seagate has a three-year warranty, a 600,000-hour MTBF, and a 350G (gravities) non-operating, 2ms shock tolerance. ▲

**by Marty Sems**

# Maxtor DiamondMax D540X 80GB

**DiamondMax D540X 80GB**
$199.95
Maxtor
(800) 262-9867
(408) 432-1700
www.maxtor.com

The new ante in hard drive technology is the ability to store 40GB on one 3.5-inch hard disk platter. Considering that a three-platter drive with 40GB disks could blow past the then biggest 100GB EIDE drives, and the hints Maxtor had been dropping as part of its Big Drives/Fast Drives promotion, it was no surprise when it announced the 160GB D540X. Ooh, doggies.

Today, though, I'm more concerned with Maxtor's DiamondMax D540X 80GB ($199.95). Yes, that's D540X, and not 540DX, which would more faithfully follow Maxtor's earlier conventions regarding drive nomenclature. The D540X dubbing even confused Maxtor representatives I met at the TECHXNY show in New York in June; some thought it was a typo.

In any case, Maxtor built a 5,400rpm, 80GB drive out of its 40GB platters, in contrast to Seagate's 7,200rpm Barracuda ATA IV. The D540X is primarily intended to be low-cost, big-gigs storage for OEMs to sell in desktop PCs. It has a 300G (gravities) nonoperating, 2ms shock tolerance, 30dB to 32dB sound levels when idle, and 31dB to 36dB ratings when seeking. These figures mean this Maxtor is reasonably robust and quiet. It also has a three-year warranty.

Its relatively high 10.5ms advertised read seek time translated to a ho-hum 16.4ms random access time in our HD Tach 2.61 tests. The D540X had good, but not outstanding, sequential rates. These included 28MBps and 35MBps average and maximum read rates, with corresponding 17.7MBps and 24.4MBps write rates. We tested it on a 600MHz PIII PC with 128MB of RAM, WinMe, and a HighPoint DMA/100 controller.

The D540X may have a tough road ahead of it. The Barracuda ATA IV has faster access times and data transfers (except maximum read rate), a higher shock tolerance, and quieter operation. However, ever since Maxtor dropped the initial price of the D540X to $199.95, I've been able to get behind it more easily. ▲

**by Marty Sems**

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Plextor PlexWriter 24/10/40A

Plextor has again muscled its way to the head of the CD-RW crowd. Its PlexWriter 24/10/40A, an internal, tray-loading EIDE (ATAPI-4) drive, has some of the best stats around.

The Plug-and-Play PlexWriter, which works on Windows 98/NT4/2000/Me/XP, caused no installation problems. Our lab technicians installed the drive on a 600MHz Pentium III-EB system with 128MB of RAM running WinMe and then ran TestaCD Lab's CDTACH 2 benchmark utility.

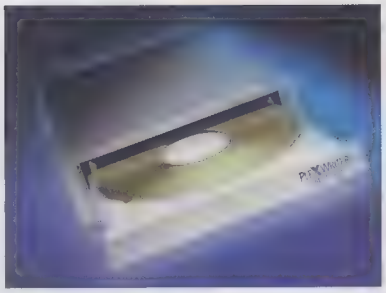
The PlexWriter came through with a 4,685Kbps average read speed and a 27.5X weighted average drive rating. The maximum, however, was better than the advertised 40X: The fastest speed we measured was 6,218Kbps; a 41.5X drive rating. The drive also had an impressive 116ms random-access time (however, this was less than the advertised 140ms average) and 258ms full-stroke access time.

For burning speeds, the PlexWriter transferred 427MB of data to CD-R media in 5:40 and the same amount of data to CD-RW media in 6:39. While this isn't the best (TDK's 16X/10X/40X veloCD, for example, did about two minutes better than the PlexWriter when transferring to CD-R), there aren't many drives that are faster.

Bundled software includes Plextor's own PlextorManager2000 for audio CD burning, as well as Easy CD Creator and Direct CD from Adaptec (now Roxio). As Plextor's marketers point out, the pros like Plextor. And for good reason, as Plextor consistently leads the way in implementing BURN-proof technology for fluid CD burning uninterrupted by buffer underrun errors.

With its combination of BURN-proof technology, a 4MB buffer, and the ability to write an entire disc at once or one track at a time, the PlexWriter is bound to satisfy. And because Plextor is a company with staying power, it's not likely to flake on its promise of a full one-year warranty and unlimited free tech support. To top it off, it has a competitive $269 price tag. Even if that were its street price, it would be a bargain. ▲

**by Cal Clinchard**



**PlexWriter 24/10/40A**
$269
Plextor
(800) 886-3935
(510) 440-2000
www.plextor.com

# Philips PCRW2010

The PCRW2010, the latest CD-RW drive kit from Philips, offers a package that's fast, inexpensive, and reliable enough to satisfy most users. High-end users might prefer a buffer larger than 2MB, but they can go elsewhere and pay a couple hundred dollars more.

Our lab technicians installed the drive on a 600MHz Pentium III-EB system with 128MB of RAM. They reported that setup was easy, with zero snags, which could be partly accounted for by Philips' interactive, easy-as-1-2-3 installation procedure, complete with video instructions.

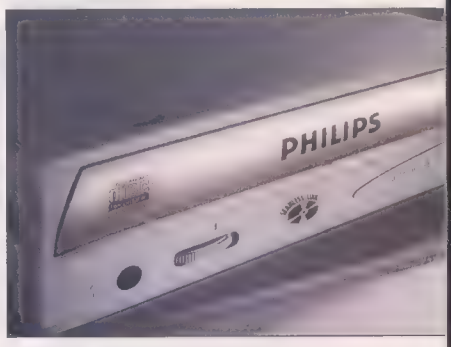
We ran TestaCD Lab's CDTACH 2 benchmark utility to test the drive's data transfer rate and access times, and the results were pretty good. Philips advertises that the PCRW2010's drive speed is 20X max; during our testing it came in at an average of 2,855Kbps for a 19X drive rating, but the max was indeed higher, at 3,203Kbps for a 21.4X drive rating. The random access time was 96ms (good), and the full stroke access time was 192ms (not as good, but OK).

The drive came through best when we put it to the practical test of transferring data to CD-R and CD-RW media. For transferring 427MB of data to CD-R, we clocked the PCRW2010 at 4:00, and the time was 5:55 for transferring the same amount of data to CD-RW.

The PCRW2010 runs on Windows 98/NT4/2000/Me, and it's allegedly ready for WinXP. It plays all the standard formats—Audio CD, CDDA, CD-ROM, CD-ROM XA, CD-R, CD-RW, CD-i, CD-Extra, and Video CD.

The drive bundles the necessary internal drivers and AHEAD Software's Nero 5 for clean ripping, free from buffer underruns. Nero and the drive's 2MB buffer add up to happy, coaster-free burning. If you're looking at CD-RWs in the $150 range, consider this one, as well. Although the MSRP is $229, rebates and street price competition should bring it down below $200. Even at $229, though, this is a drive you'll want to consider. ▲

**by Cal Clinchard**

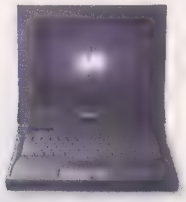



**PCRW2010**
$229
Philips Electronics
(800) 326-6586
(212) 536-0500
www.pcstuff.philips.com

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# I've got strength in numbers...and in options.

## Dell | Home Notebooks



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intel inside pentium 4

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# AMD Athlon XP

In recent years, AMD and Intel have been boxing-clever over MHz, but perhaps in the current economic climate, this has been detrimental to both parties. Nonetheless, the show must go on. With AMD's most recent release, the 37.5-million transistor, 0.18-micron Palomino core-based Athlon XP 1800+ (1.53GHz; $252), 1700+ (1.47GHz; $190), 1600+ (1.4GHz; $160), and 1500+ (1.33GHz; $130), the company is set to go toe to toe with Intel's current Pentium 4. Sporting a new-look OPGA (Organic Pin Grid Array) fiberglass package, the XP, which stands for "Extreme Performance," will be compatible with many, though not all, Socket A boards and comes in crucially cheaper, until Intel strikes back.

Simply stated, Palomino is more efficient than the Thunderbird core it replaces. According to AMD's marketing, this is due to "QuantiSpeed" Architecture, which consists of hardware data prefetch, exclusive and speculative TLB (Translation Look-aside Buffers), nine-issue superscalar fully pipelined microarchitecture, and a superscalar fully pipelined FPU (Floating Point Unit) all rolled into one XP sandwich. With 51 new instructions, called 3DNow! Professional, the Palomino is also fully SSE2 compatible.

**Athlon XP**
AMD
(408) 749-3060
(800) 222-9323
www.amd.com

Lowering power consumption isn't going to help California out of its power crisis, but Palomino's on-chip thermal diode is much appreciated anyway.

However, get ready for the Apple-inspired dreaded performance rating nomenclature, which may peeve traditional AMD users who tend to be DIY/gamers/enthusiasts and don't take kindly to marketing merde. Herein lies the controversy: XP processors will not be labeled according to clock speed. AMD will use "Model Numbers" that are regulated to the clock speed performance of Athlon Thunderbirds. So the XP 1800+ actually runs at 1.53GHz but theoretically would outperform a T-bird 1.8GHz if such a bird existed. And because clock speed was a good indicator of performance comparability between Thunderbird and P4, this naming feature also works when compared to Intel's current offerings without getting into that nasty area of product libel.

Though AMD has taken some heavy criticism from the tech-savvy enthusiast press, you might want to take into account that this new naming convention really wasn't designed for you. It's for your uncle Albert (bless his heart) who doesn't know his quad-pumped from his on-die L2 cache. When he pops into Circuit City and sees a P4 2GHz system alongside an Athlon 1.53GHz, he would naturally assume that the "2GHz" means faster, and that his deserving nephew, Clarence, will be more content with that 2GHz. By doing so, our Albert will miss the fact that, in terms of Instructions executed Per Clock x frequency, the Palomino running at 1.53GHz is at least level with a P4 2GHz, not to mention that it's also cheaper. So I say, if the XP 1800+ label makes it more informative to the Alberts AND is actually a true representation of performance, then I personally don't have to like it.

Clock speed is Intel's forte, and its P4 chip's deep pipeline lets it reach unparalleled clock speeds, hence the recent 2GHz breakthrough. AMD's message is that the XP's more efficient architecture, at slower frequencies, can actually outperform a higher clocked P4, and the benchmarks show this. (See "Athlon XP Benchmarks" chart.) Though the P4 2GHz still reigns in Quake III and SYSmark2001, (unless you add an AMD-supplied patch, which reportedly only forces MediaEncoder 7 to recognizes the XP's CPUID), the performance lead otherwise favors the 1800+. But it's not as though anyone saddled with a P4 2GHz need feel shortchanged at a LAN party.

Skeptics will remember the days of the K6, but that's History Channel now. Palomino is stable, yet overclockable (connect the L1 bridges with a tracer pen to unlock the multiplier), has a wide variety of DDR RAM-based platforms from which to choose, and doesn't cost an arm and a leg (unless you have small hands). Yet AMD still finds the going rough.

Corporate users are more likely to be concerned with ease of use, setup, reliability, and brand name. Historically, Intel has been the top dog, and in this dog-eat-dog world, Intel has bigger teeth. Gateway has recently dropped Athlon systems, while MicronPC has stated it will not sell them to the business sector. With HP acquiring Compaq, corporate partners are thin. Dell has never offered Athlon-based systems and yet boasts about spending the least on tech support. The current share price coupled with poor earnings confirm that AMD is still ice skating uphill in the corporate space, even if it does have the enthusiasts satisfied.

Approximately $250 less than and equal in performance to the P4 2GHz, the Athlon XP 1800+ takes the biscuit. So unless the P4 "Northwood" (expected soon enhanced with 512KB on-die L2 cache) bites back, I'll keep fragging away on the XP. The 1800+ scores high, being affordable and fast and boasting impressive technology. ▲

**by Alex "Sharky" Ross**

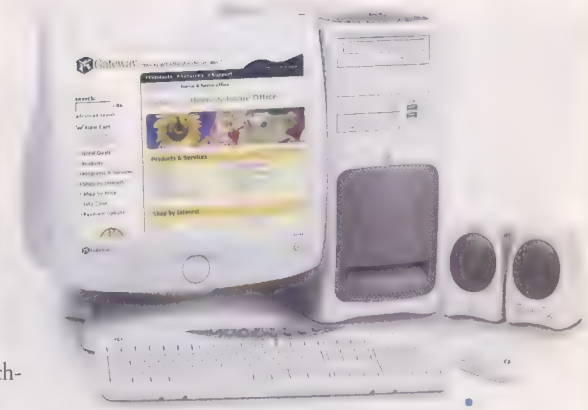
**Athlon XP Benchmarks**

| | XP 1800+ | P4 2GHz |
|---|---|---|
| Quake III | 239.2fps | 252.7fps |
| Max Payne | 112.3 | 103.7 |
| Unreal Tournament | 75.1 | 72.3 |
| 3DMark2001 | 7,813 | 7,565 |
| SYSmark 2001* | 180 | 193 |
| *with AMD's patch | 197* | N/A |

Tests conducted on Windows 2000

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Gateway Performance 1800XL



**Performance 1800XL**
$2,799
(including flat-panel display)
Gateway
(800) 846-4208
(605) 232-2000
www.gateway.com

Few things make my day like testing the latest desktop PC from a top manufacturer. Gateway's Performance 1800XL radiates with power. It's obviously designed to get the attention of die-hard gamers and power users who want the best system money can buy.

The Performance 1800XL has a 1.8GHz Intel Pentium 4 processor and a 400MHz bus speed, which will keep your applications zipping along nicely. The system I tested had 128MB of RDRAM, but you can increase the amount of memory to a massive 2GB. However, when you order the system, Gateway will only increase the system's memory to 512MB. You'll have to add the rest yourself. This system also uses the Windows Me operating system.

One of my favorite features of the Performance 1800XL is the NVIDIA GeForce3 video card. GeForce3 video cards are hot products these days, and with good reason. They deliver fast, beautiful PC 3-D graphics. The 1800XL's GeForce3 video card has the usual 64MB of DDR-SDRAM.

Gateway normally includes a 19-inch EV910 display with this system, but the company decided to send a 15-inch FPD1510 display with our test system. The optional flat-panel display is a mere $200 more than the EV910, which is a pretty good deal if you're interested in such a thing. I think it's a nice product; however, I still prefer the EV910 monitor, even though it requires a lot of desktop real estate.

Gateway didn't skimp on the audio hardware in the Performance 1800XL, either. It has a Creative Labs Sound Blaster Live! series sound card, and you have several speaker options from which to choose. The system also came with a cool five-piece set of Boston Acoustic BA7500 Dolby Digital SST speakers.

Most new computers have both a DVD drive and a CD-RW drive, and so it is with the Performance 1800XL. It has a 16X DVD drive and a 12X/8X/32X (write/rewrite/read) CD-RW drive, a common configuration for higher-end PCs. This PC also has a 80GB hard drive, the largest hard drive available from Gateway.

Our lab ran the usual benchmarks on this system, and it yielded better than usual results. The Overall SYSmark2001 score was 154, which is really good. The Office Productivity score of 143 and the Internet Content creation score of 165 are both higher than average, and the Performance 1800XL's Video2000 total score of 2,267 is also pretty high. We also ran the 3DMark2001 benchmark on this PC, and it posted an impressive total score of 5,830.

I took a first-hand look at the Performance 1800XL after the benchmark testing. For the most part, the system ran well. I did run into a small problem, though, when I tried to play a DVD movie on it. The DVD player software locked up on me a couple of times. I had the flat-panel display connected to the PC, and I suspected that was the source of the problem. I turned down the display's color depth one notch (from 32-bit color) and ran the DVD again. This time, the DVD ran properly. The movie looked nice and crisp on the flat-panel display. I also ran it while connected to the 19-inch EV910 monitor, and I like the larger display a little better.

Next, I immersed myself in a few rounds of Quake III, first with the flat-panel display and then with the EV910. I loved playing this game on the Performance 1800XL; it ran beautifully using the flat-panel display. The on-screen action never slowed down. When using the EV910 monitor, I was able to comfortably play Quake III at a resolution 1,600 x 1,200. I noticed just an occasional bit of lag at this resolution, but it wasn't disruptive.

I finished testing the Performance 1800XL by listening to some of my favorite blues tunes. The Boston Acoustic speakers included with the system sounded incredible during the movie and the game, and they sounded even better cranking out some of Stevie Ray Vaughan's greatest hits. The speaker's subwoofer dishes up a satisfying bass thump, and the four flat-panel surround speakers look nice, save space, and sound just fine.

The Performance 1800XL is a superior multimedia PC that has just about everything you could want in a power-user system: the fastest processor and video card available, lots of storage, a top-notch sound card, and speakers that sound almost as good as those of a home stereo system. ▲

**by Michael Sweet**

## Features

**Processor:** 1.8GHz Intel Pentium 4

**RAM:** 128MB RDRAM

**Hard Drive:** 80GB

**Optical Drive:** 16X DVD; 12X/8X/32X

**Connectivity:** 56Kbps modem;10/100 network adapter

**Graphics Accelerator:** NVIDIA GeForce3

**Monitor:** 15-inch FPD1510

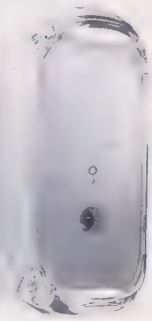
**Chassis:** Mid-tower

**System Use:** Entertainment

**Final Word:** Fast and furious system.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Apple Power Mac G4 867MHz



**Power Mac G4 867MHz**
$3,098 (including monitor)
Apple
(800) 538-9696
(408) 996-1010
www.apple.com

**Processor:** 867MHz PowerPC G4

**RAM:** 128MB PC133 SDRAM

**Hard Drive:** 60GB 7,200rpm

**Optical Drive:** SuperDrive; combination 4X DVD, 2X DVD-R, and 8X/4X/24X CD-RW

**Connectivity:** 10/100/1000Mbps Ethernet; 56Kbps modem; FireWire; USB

**Graphics Accelerator:** NVIDIA GeForce 2 MX

**Monitor:** 15-inch Apple Studio Display flat-panel (optional)

**Chassis:** Mid-tower

**System Use:** Personal Use; Small Office

**Final Word:** Gorgeous system; very good performance; expensive, though

How many computers turn the heads of passersby? When we unpacked Apple's new Power Mac G4 867MHz, people dropped what they were doing to check it out. We see a lot of new PCs, but no one walks into the potted plants to get a better look.

The G4 comes with Mac OS X (specifically, ours had 10.0.4), which, like Linux, is based upon the veteran Unix OS. Apple also includes Mac OS 9.2 in a dual-boot setup with the G4 for faster performance when running previous Mac applications. This is fine while OS X apps trickle onto the scene.

**Specifications.** The 867MHz PowerPC G4 CPU inside this Power Mac is the fastest single processor ever to come in an Apple system. It felt exceptionally quick at everything we did, partly because of its design and its 2MB L3 cache.

The system has 128MB of PC133 SDRAM; a 60GB, 7,200rpm hard drive; and a 32MB, 4X AGP NVIDIA GeForce 2 MX video card that dishes out great 3-D graphics for games or design work.

The fun stuff is the G4's SuperDrive combination DVD-R/CD-RW drive, which is a 2X DVD-R writer, 4X DVD player, and 8X/4X/24X CD-RW. A DVD-R disc can store 4.7GB for around $10 ($49.95 for five through Apple).

**Design.** I'm very impressed with the G4's curved, transparent case and peripherals. There's no way I can ever again look at a typical beige or gray PC as anything but homely. The SuperDrive's eject button is on the keyboard, and the pretty optical Pro Mouse doesn't have a wheel or a second button, but there's still function within the G4's form.

There are two USB and two FireWire ports (Apple's term for IEEE 1394) on the back of the G4's case, with two more USB ports on the transparent keyboard. The rear panel has jacks for the built-in 10/100/1000Mbps (gigabit) Ethernet and 56Kbps modem.

Our review unit came without speakers, so I focused my attention on the deluxe single speaker built into the sound chamber at the system's front. This is a far richer, punchier component than any PC speaker I've heard. However, it's still no match for a decent pair of satellite speakers. Apple says the G4's digital speaker jack is intended for the matching harman/kardon-based Apple Pro Speakers ($59), but you can attach USB speakers if you like.

I really appreciated Apple's idea for opening a computer case: just lift a rubberized ring, and lower the hinged side panel and motherboard simultaneously. This gives tinkerers easy access to the PCI slots and unused drive bays. However, they'll have to pull the video card to access the two free DIMM slots (1.5GB maximum). Finally, the motherboard has a header (connector) for an Airport wireless 802.11b networking card (a $99 option).

Apple systems normally don't come with monitors, so I'm grateful the company sent us a 15-inch viewable area Apple Studio Display ($599) with our G4. Even the back panel of this remarkable flat-panel monitor is stylized with Apple's logo, and it has a couple of USB ports to boot. The monitor's active matrix display is exceptionally crisp and colorful, like a night in Times Square after updating your contact lens prescription.

**Performance.** We don't benchmark Apple systems, but we do run their demanding applications, such as the iDVD authoring program and iMovie 2 for video editing, to get a feel for their speed. I played a DVD movie, audio CDs, and a Mac version of the 3-D game Quake III Arena on this hot G4 for some real-world multimedia evaluation.

OS X and its impressive Aqua interface were very responsive. However, I had to boot up to Mac OS 9.2 to watch my "X-Men" DVD, which played as smoothly at full screen as any PC I've seen. Afterward, I stayed in OS 9.2 for Quake III Arena after bumping up the Power Mac's virtual memory to get the game to run properly. Once the fragging commenced, though, the GeForce 2 MX absorbed me with uninterrupted action up to the monitor's top resolution of 1,024 x 768.

**Final word.** The G4 is a hefty $2,499 without the optional $599 flat-panel monitor. That's quite an investment by PC standards, but the G4 nears the pinnacle of performance in today's Mac world.

Besides the OSes and apps mentioned above, the G4 867MHz comes with Microsoft Outlook Express, Internet Explorer, Netscape Communicator, and more. It has a one-year limited warranty and 90 days of phone support. ▲

**by Marty Sems**

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# IBM ThinkPad X21

Notebook users can be a fickle bunch. On the one hand, they want a notebook with all the features you'd expect from a desktop, such as an optical and floppy drive. On the other hand, they want a thin, light model that's easy to carry around. The IBM ThinkPad X21 attempts to deliver on both counts. The X21 is a mininotebook, but the optional Media Slice clips to the bottom of the notebook, letting you turn the one-spindle waif into a three-spindle multimedia machine.

**Specifications.** The 700MHz processor in the X21 is a few hundred megahertz behind the processors you'll find in high-performance notebooks, but a slower processor does offer some gains in terms of battery life. The X21 features 128MB of SDRAM that you can upgrade to 384MB. The limited available space within the X21 precludes additional drives beyond the 20GB IBM hard drive. An ATI Rage Mobility M graphic chipset with 4MB of SDRAM drives the 12.1-inch TFT display.

Being lucky enough to have a broadband Internet connection at home, I was happy to see our X21 came equipped with integrated Ethernet. When I'm on the road, I probably won't have such luxuries, but the V.90 modem provides a fallback option. A single Type II PC Card slot lets you add other networking capabilities, including wireless networking support (which is not integrated with the X21).

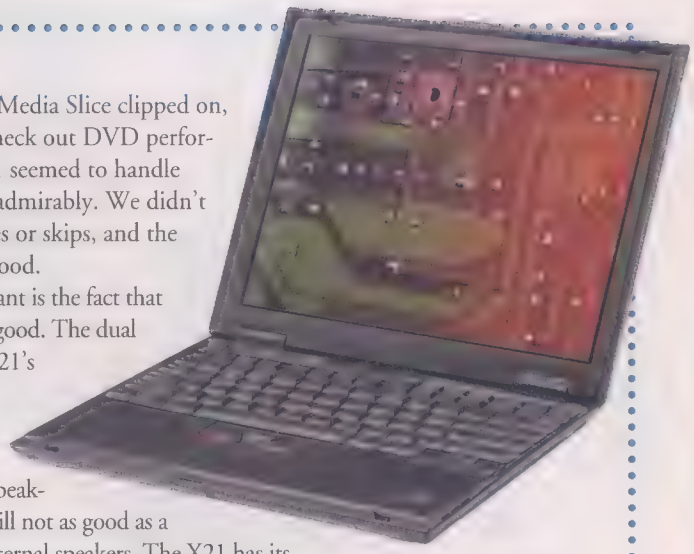
IBM sent the optional X2 Media Slice ($189) along with the X21. The X2 Media Slice includes an UltraBay 2000 device bay and an integrated floppy drive in addition to several extra ports (such as a serial, parallel, and PS/2). Through the UltraBay 2000 device bay, you can add an optical drive or one of many other accessories (including a camera, Bluetooth module, or infrared port). The X21 also will fit IBM's ThinkPad Dock ($502), and ThinkPad Port Replicator ($170).

**Design.** If you've seen one ThinkPad, you've seen them all. There's nothing in the black plastic case, red TouchPoint nub, and angular shape that ThinkPad admirers haven't already seen. I found the overall design to be sharp and professional but perhaps a bit on the tired side. Then again, the X21 isn't intended to be a fashion accessory.

ThinkPads traditionally have great keyboards, and the X21 is no exception. Despite its small size, the keyboard remains spacious and easy to use, but I found myself wishing the keys were a bit firmer.

With the X2 Media Slice clipped on, I was ready to check out DVD performance. The X21 seemed to handle DVD playback admirably. We didn't notice any pauses or skips, and the display looked good.

Just as important is the fact that DVDs sounded good. The dual speakers in the X21's docking station provided better sound than most notebook speakers, but they're still not as good as a quality pair of external speakers. The X21 has its own single speaker that it uses when not attached to the Media Slice. The speaker is fine for system sounds, but you'll want the docking station or a pair of external speakers if you plan to listen to digital music.



**Performance.** The X21's SYSmark2000 scores were a little disappointing, considering the older 600MHz X20 actually posted slightly better numbers than the 700MHz X21. The X21 posted an Office Productivity score of 104 and an Internet Content Creation score of 118 for an overall score of 111 (comparable to SYSmark2001 scores of 54, 59, and 56, respectively). The X20, by way of comparison, posted a 124 overall SYSmark2000 score.

Video2000 scores were decent for a notebook of this size. A Video Mark score of 1539 doesn't look too good at first glance, but considering the ATI Rage Mobility graphics chip is only accompanied by 4MB of video RAM, the number isn't too bad. The 4MB of dedicated video memory is better than using system memory, a solution some notebooks turn to in order to cut size and expense. If you purchase the optional Media Slice and a DVD-ROM drive, you'll have plenty of hardware to handle DVD movies.

According to IBM, the X21 should have a battery life of about 4.9 hours. As always, your mileage will vary depending on how you use the device.

**Final word.** Despite a small drop-off in performance, the X21 is still a great mininotebook, especially with the optional Media Slice. We recommend the X21 to frequent travelers who may need additional resources. ▲

**by Chad Denton**

### ThinkPad X21

IBM
$2,449
(888) 746-7426
(914) 499-1900
www.ibm.com

CPU CPU CPU CPU

Features

**Processor:** 700MHz Pentium III

**RAM:** 128/384MB

**Display:** 12.1-inch TFT

**Dimensions (inches):** 1.2 x 11 x 8.9

**Weight (pounds):** 3.52

**Hard Drive:** 20GB

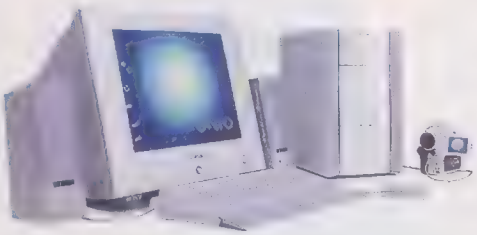
**Optical Drive:** DVD/CD-RW combo drive

**Connectivity:** modem; Ethernet

**Final Word:** The docking station lets you leave optical and floppy drives behind. The ThinkPad X21 offers decent performance for a notebook of this size.

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

# Sony VAIO PCV-RX590G



**VAIO PCV-RX590G**
$2,499 ($2,948 w/ monitor)
Sony
(888) 595-8246
(941) 768-7669
www.sony.com

**Features**

**Processor:** 2GHz Pentium 4
**RAM:** 256MB RDRAM
**Hard Drive:** 100GB
**Optical Drive:** DVD-RW/CD-RW; CD-ROM
**Connectivity:** Ethernet; modem
**Graphics Accelerator:** NIVIDIA GeForce2 MX
**Display:** 19-inch Sony
**Video RAM:** 32MB SDRAM
**Chassis:** Minitower
**System Use:** Entertainment
**Final Word:** 2GHz; Digital TV show recording and SuperDrive; expensive

Sony says its revamped RX Series replaces the three separate VAIO desktop PC lines, including the J, RX, and Digital Studio Series. This VAIO takes on the functions of the Digital Studio series, as well, crossing the line between PC and television in a way that sounds useful.

Not only is this VAIO among the first OEM systems I've seen with WinXP, it's also the first I've personally seen with Intel's new 2GHz Pentium 4. What really sets it apart from other new RX Series VAIOs, however, is its Giga Pocket Personal Video Recorder software. This turns the system into a digital video recorder for your television, similar to the technology used in TiVo units. You can set Giga Pocket to record incoming television shows to your hard drive, using online program listings specific to your ZIP code. The difference is that while TiVo charges a monthly fee for its online listings service, Sony says it doesn't charge a thing.

**Specifications.** My VAIO had 256MB of PC800 RDRAM, which is impressive enough, but production models will have a ridiculously huge 512MB. This VAIO's video adapter is a 32MB NVIDIA GeForce2 MX. Although many high-end systems come with GeForce3s, the GeForce2 MX currently packs the most bang for the buck.

The 5,400rpm, 100GB Maxtor hard drive is abundantly large and quick enough for the television shows you'll record to it. After you're done, you can burn your favorite shows to DVD-R or DVD-RW with the Pioneer DVR-103 SuperDrive.

Note that the system doesn't come with the monitor and camcorder shown here. I used a gorgeous 19-inch Sony Trinitron A400 monitor, which is a $449 option, to try this system out.

**Design.** Like the other RX Series VAIOs I reviewed, this one came with a 56Kbps modem and a 10/100Mbps Ethernet jack. It also had two Sony PCVA-SP2 speakers that may almost make you forget there's no subwoofer. The multimedia keyboard and contoured mouse look like they're universal across the VAIO lineup.

The PCV-RX590G's metal-colored case is a minitower design that lets you open it without a screwdriver. But it's crowded enough inside to make upgrading a chore. The power supply and diskette drive bay are hinged, though, which can give you better access to the motherboard.

This VAIO's other goodies include an infrared remote control and receiver so you can control the television shows you'll be watching on the computer screen. Extra jacks for S-video out, composite video out, and right and left RCA speaker jacks are under the bottom front panel, so you can export your entertainment to your home theater system. The final version will also have a HomePNA (Home Phone Networking Alliance) networking adapter, which my test system didn't have.

**Performance.** We had to wait a while for MadOnion.com to send us patches for BAPCo SYSmark2001, Video2000, and 3DMark2001 so that these benchmarking utilities would run under WinXP. Video2000 never did finish testing this VAIO, even with the patch, but the other two programs eventually gave us solid results.

The 2GHz P4 and mammoth amount of RAM in this Sony help it smack the ball out of the park in SYSmark2001. That's a genuine 189 SYSmark, with a 212 Internet Content Creation score riding high over a 168 Office Productivity rating. As for 3-D graphics prowess, the GeForce2 MX card shows its stuff with a 2,403 score.

As expected, the VAIO played the DVD movie "The Matrix" and Peter Gabriel's "So" audio CD flawlessly. Also, I didn't want to quit playing Quake III at the 1,600 x 1,200 resolution. Ever. My only gripe is that this $2,499 system ($2,948 with monitor) doesn't have a subwoofer. Again, the Sony speakers did a great job at all sound frequencies, but at this level of PC power, I expect to have my guts shaken a tad more for my entertainment dollar.

**Final word.** The awesome software bundle only makes this superb VAIO more attractive. Besides Sony multimedia programs such as DVgate 2.4 and Movie Shaker 3.2, there's Corel WordPerfect 9, Quicken 2002, PC-cillin 2000, and Tomb Raider Chronicles. There's too much to list here.

If you're considering a TiVo recorder, first consider a VAIO PCV-RX590G. It's expensive, but you'll save the TiVo's monthly fees, and you'll have the DVD-RW drive ready to archive things. You'll also have a CD-RW, 3-D gaming, and everything else a 2GHz computer can do. ▲

**by Marty Sems**

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# when you wake up,

## ...will you tap your potential?

**or tap the snooze button?**


Meet the newest Harvest® bar, the delicious morning energy bar from PowerBar, with chocolate chips and the awesome taste of toffee. And it's loaded with soy protein and 16 essential vitamins and minerals to help you tap your full potential. So grab one. And don't just start your morning. Jumpstart it.

PowerBar Be great.

# ABS Performance System 2 1.7GHz

**Performance System 2 1.7GHz**
$1,449
ABS
(800) 876-8088
(562) 695-8823
www.buyabs.com

CPU CPU CPU CPU CPU

If I were building a killer PC for 3-D gaming, CD burning, and a home theatre, I'd choose parts from the same bin that ABS did to make the Performance System 2. Apart from the 256MB of PC800 Rambus behind the 1.7GHz Pentium 4, all of this system's multimedia gear is just a step down from cutting-edge. It's still hot stuff, it's just not hot enough to be really expensive anymore. The result is an entertainment blockbuster for just $1,449. Oh, yeah, it can also run dull apps, too.

**Specifications.** Too often inside PCs in this price category I see volume discounts instead of devices themselves. I perk up seeing one or two cool items, such as CD-RW, then get bummed about the necessary concessions to cost. One more integrated Intel graphics adapter, I think, and the cookies that went down at lunch will arise before supper.

I get no such feeling with this ABS. Starting at the top of its midtower case, there's an AOpen DVD-1640 Pro 16X DVD-ROM drive with a slot instead of a tray. Right below it is a Lite-On LTR-12101B 12X/10X/32X CD-RW drive with Burn-Proof technology to avoid buffer underruns. Our test system had a 40GB, 7,200rpm IBM Deskstar 60GXP hard drive. It isn't available at this writing, but ABS says it should be by the time you read this.

This system comes with a very nice Hitachi CM715 19-inch monitor powered by a 32MB DDR GeForce2 Pro graphics card. For your aural pleasure, there's a Sound Blaster Live! X-Gamer 5.1 pushing four Altec Lansing ACS-54 speakers and a subwoofer. Finally, a 10/100Mbps network card and 56Kbps modem let you choose how you want to connect to the world.

**Design.** Five fans—yeah, five—cool this PC. It's easy to reach every bit of the motherboard. There's no IEEE 1394 here. However, there are a couple of PCI slots left open, so you can throw in a 1394 card if you need to. There are four USB 1.1 ports, all rear-mounted.

**Performance.** Clutching a "Matrix" DVD and games, such as Quake III Arena and Unreal Tournament, I walled off a Friday afternoon to spend with this magic system. "Gimme some sugar," I told it. It did.

First the ABS and I tore up the lobby in Scene 29 of "The Matrix." As always, the soldiers in the film didn't have a chance, but at least they didn't stutter or get all pixelated as they succumbed. Before the brass on the digital floor had even cooled, I switched to Quake III Arena and Unreal Tournament for some more extremely antisocial behavior. In retrospect, I imagine I could have found more nonviolent ways to flog the GeForce2 and P4, but it was just that kind of an afternoon.

All my virtual rampage flowed as smoothly as the first ice skating of the season. Quake III felt great right up to the monitor's 1,600 x 1,200 maximum resolution. I jacked Unreal Tournament up to 32-bit color depth, 3-D sound, and progressively higher resolutions. It finally started to show signs of stress at 1,280 x 960. If you're not happy with that level of 3-D fun, you're probably going to spend a lot more money for slightly faster stuff. This PC makes awesome gameplay affordable.

We're now testing sub-$1,500 PCs with SYSmark2001, Video2000, and 3DMark2001 instead of the 2000 versions. This ABS system's highlights include an excellent 3,320 3DMark2001 score, with a very good 150 SYSmark2001 rating to back it up. Many P4 systems at this price use SDRAM now, so this Rambus system's performance stands out.

**Final word.** ABS includes a huge binder for this PC's numerous software and driver CDs. It also includes manuals for nearly everything, right down to the Asus motherboard (which will replace the MSI MS6339 Pro motherboard currently offered). And check out this software package: Thief II, Deus X, MDK2, and Unreal Tournament. There's also Corel Office 2002, WordPerfect 2002, Easy CD Creator 4, and CyberLink PowerDVD.

ABS's warranty on labor is three years; on parts, it's for life. Here's hoping this level of support isn't too good to be true. This system is another testament to the high quality a smaller manufacturer can deliver. Again, we don't generally feel comfortable touting PC vendors that don't have nearly the track record and deep pockets of, say, Dell. But if a company such as ABS can continue to deliver great stuff even during these dark days for the industry, perhaps it's not going away anytime soon. ▲

**by Marty Sems**

## Features

**Processor:** 1.7GHz Pentium 4

**RAM:** 256MB PC800 RDRAM

**Hard Drive:** 40GB 7,200rpm

**Optical Drive:** 12X/10X/32X CD-RW; 16X DVD-ROM

**Connectivity:** Realtek 10/100Mbps Ethernet; 56Kbps modem

**Chassis Type:** Mid-tower

**System Type:** Entertainment

**Display:** 19-inch Hitachi CM715

**Graphics Accelerator:** LeadTek GeForce2 Pro

**Final Word:** High-quality components; great entertainment system

CPU Ranking: 0 = Absolutely Worthless CPU CPU 2.5 = Absolutely Average CPU CPU CPU CPU CPU 5 = Absolutely Perfect

by Anand Lal Shimpi

# AMD's Athlon XP:
## Classy Performance, Poor Marketing

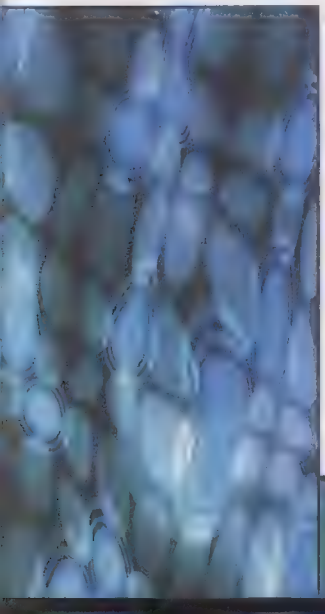
It's been over two years since AMD's Athlon microprocessor was released and on Oct. 9, 2001, AMD extended the Athlon line yet again with the Athlon XP microprocessor. What's so special about the Athlon XP? If you ask AMD, they will tell you that the Athlon XP's "QuantiSpeed" architecture allows it to operate at lower clock frequencies (for example, 1.53GHz) than the competition while offering equal or greater performance. That's the watered down explanation that you don't want to hear. The Athlon XP has been around for a few months now, just in a different form. The core of the processor is known internally to AMD by the name Palomino and this core was actually used on AMD's Mobile Athlon 4 (laptops) and Athlon MP chips (multiprocessor servers/workstations). In order to play the marketing game a bit, AMD decided to call the mainstream desktop version of their Palomino-based Athlon the Athlon XP. While AMD will tell you that the "XP" moniker means it will give you a better overall eXPerience, it's very clear that they are riding on the coattails of Microsoft's Windows XP operating system. The marketing machine doesn't stop there, however; AMD is also introducing a new modeling system for the Athlon XP but to understand this modeling system you have to understand a bit about microprocessor architecture.

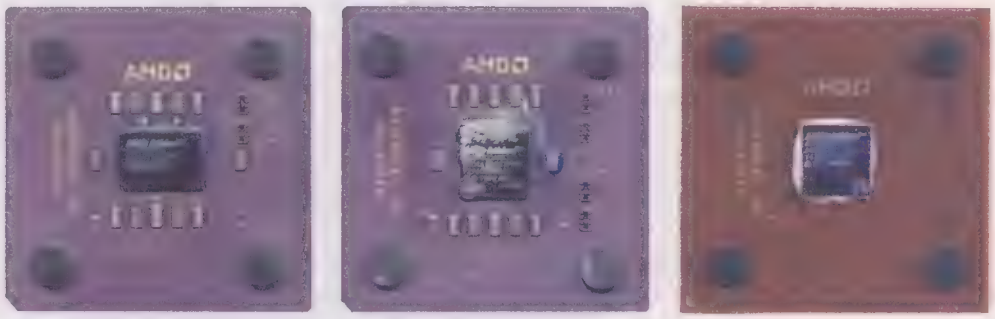
**The architecture and design of the AMD Athlon XP won't allow AMD to hit 2GHz until sometime next year and by that time Intel will be up to 2.5GHz already.**

There are two parts to the performance equation when dealing with microprocessors. The first part is how much work a microprocessor can do at any given moment. Since the majority of today's microprocessors operate in sync with the cycles of a clock, we can say that the first part of the performance equation is the amount of work a microprocessor can do in a single clock. This is known as the microprocessor's IPC or the number of Instructions Per Clock it can execute. The second part of the equation is clock frequency, or how many clock cycles it can execute in a single second. This is the megahertz or gigahertz rating you see on processors. This gives us the equation: Performance = IPC x clock frequency.

Obviously to get the best overall performance you'd want a high IPC and a high clock frequency, but it's far from being that easy. In fact, it turns out that if you want to maintain a very high IPC, it's often very difficult to get your microprocessor to run at high frequencies and vice versa. So there's often a tradeoff, usually IPC for clock speed, that is made when designing microprocessors. Case in point would be Intel's Pentium 4; the Pentium 4 has a lower overall IPC in most situations than the Pentium III and the AMD Athlon. It is this low IPC, however, that allows the Pentium 4 to scale to very high clock speeds. It is currently running at 2.0GHz and will reach 2.2GHz

*Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in* USA Today, *CBS' 48 Hours and* Fortune. *His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.*





From left to right: AMD's Athlon (Thunderbird core), Athlon MP (Palomino core), and Athlon XP (Palomino core). You can see the difference in packaging between the Athlon XP (organic) and the previous two ceramic chips.

before the end of 2001. The Pentium 4 needs to run at these high frequencies in order to make up for its low average IPC. But this also means that an AMD Athlon, with a higher average IPC, can theoretically offer similar or better performance to the Pentium 4 but at a lower clock speed. The problem AMD encounters with this situation is that the average buyer that walks into a store hasn't a clue about IPC, they just see the clock speed on the processor and use that as a gauge for how "fast" something is.

The architecture and design of the AMD Athlon XP won't allow AMD to hit 2GHz until sometime next year and by that time Intel will be up to 2.5GHz already. Although at 1.53GHz AMD's Athlon XP is competitive, performance-wise, with the Intel Pentium 4 2.0GHz, conveying that information to uneducated buyers is difficult. AMD's solution is this new modeling system by which processors won't be identified by clock speeds, rather by model numbers. For example, the AMD Athlon XP debuted at 1.53GHz but AMD's name for the processor is the AMD Athlon XP Model 1800+. The 1800+ comes from the idea that the Athlon XP at 1.53GHz is able to offer overall performance comparable to and/or higher than that of competing 1.8GHz solutions (the Pentium 4).

The Athlon XP is also AMD's first chip to make use of an organic packaging technology. There are two major parts to every CPU: the core of the CPU and the package which connects the microprocessor core to the outside world. The packaging is just as important as the core because if you can't get the data the CPU is working on out of the CPU and to the rest of the computer, then you might as well not even be trying. All of AMD's CPUs prior to the Athlon XP had used older ceramic packaging technology which can limit how efficiently you design your processor. In contrast, Intel has been using more efficient organic packaging technology ever since the days of the late Pentium processors (internally known as the P54c). The switch to an organic package will pave the way for faster bus speeds and faster overall clock speeds for the Athlon XP. In the meantime it unfortunately means that the processors are a bit more difficult to manufacture, as it is AMD's first try at producing CPUs with an organic package.

From a performance standpoint, the Athlon XP is definitely a very respectable contender. But personally, I'd rather see AMD educate the buyer into why its processors are competitive than impose a rating system whose sole purpose is to mislead. ■

*Get into Anand's Corner by e-mailing anand@cpumag.com.*

*(NOTE: For a full performance report on the AMD Athlon XP and how it compares to Intel's Pentium 4 visit Anandtech.com. See the full Athlon XP review on page 30.)*

## Infinite Loop

### Crackers Hit Companies . . .

Here are a few excerpts from the "2001 Computer Crime and Security Survey," which garnered responses from government agencies, corporations, financial institutions, and organizations. The survey is conducted with the help of the FBI.

- 85% of respondents (primarily large corporations and government agencies) detected computer security breaches within the last 12 months.
- 64% acknowledged financial losses due to computer breaches.
- The most serious financial losses occurred through theft of proprietary information (34 respondents reported $151 million) and financial fraud (21 respondents reported $93 million).
- 40% of respondents detected system penetration from the outside (only 25% reported system penetration in the year 2000).
- 23% suffered unauthorized Web site access or misuse within the last 12 months; 27% said that they didn't know if there had been unauthorized access or misuse.

Source: "Computer Crime and Security Survey" From the CSI (Computer Security Institute)


### . . . As Well As Governments

In the wake of the Sept. 11, 2001, terrorist attacks, anticyberterrorism measures quickly became a top concern for government agencies and corporations. But fears of electronic-based terrorism are nothing new. In 1999, Rep. Curtis Weldon (R-Penn), was quoted as saying "It's not a matter of if America has an electronic Pearl Harbor--it's a matter of when." The numbers tell an ominous story.

- The Pentagon alone estimates its computer networks are hacked about 250,000 times a year. At least 500 are considered serious attempts at breaking into classified systems.
- In recent years officials have also secretly observed attempts by foreign countries to penetrate U.S. government computers. At least 13 countries have "information warfare" programs directed against the United States.
- U.S. officials acknowledge that they catch about 10% of those who probe or penetrate government computers.

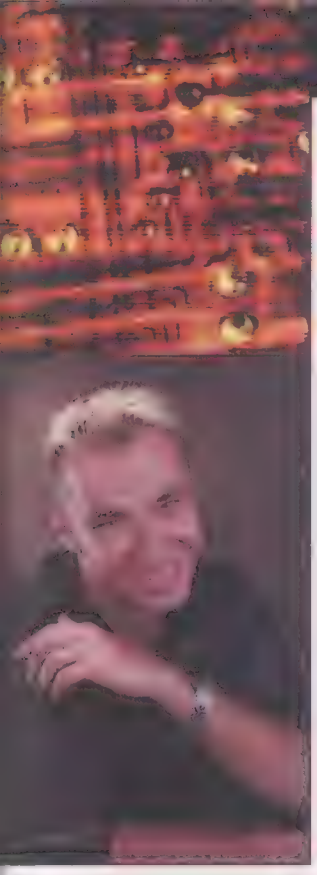
Source: "Inside the Secret Cyberwar" by Gregory Vistica; *Newsweek*, New York; Feb 21, 2000

by Alex "Sharky" Ross

# WLAN: A Tempestuous Affair

The PC industry sure is a feisty place right now. Intel takes pole position in the GHz race, but AMD drives faster anyway. NVIDIA is boxing Xs, and others can't quite get their chip together. But as always, there are some bright spots, and at least one that can make your life all the better. It's called IEEE 802.11b, but think of it as LAN unplugged.

Not often does all this great technology fundamentally change the way you work and play. WLANs have been marketed as providing mobility and convenience while not requiring expensive cabling infrastructure. What this actually means is that your home office no longer looks like a multi-level L.A. freeway spaghetti junction and, when combined with a notebook, you are finally free. Connected but unshackled. This sounds simple but can have far-reaching and pervasive effects. Warning: You might never go back to a desktop.



*Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.*

## Please Pass the Google

If catching some rays while browsing the Net (assuming you have California weather) or chatting with IM buddies during the Super Bowl floats your boat, this is as close to bliss as you'll get. You can surf at the breakfast table, chat in the back yard, and even update your Web site whilst on the potty. Now isn't that what they really meant by increased productivity?

You can visit a WLAN-happy friend, input their key on your laptop, and get online in a flash. When a few similarly equipped folks drop 'round, you can have your own WLAN Counter-Strike party.

The best part is, unlike Pentium 4, Athlon XP, or Geforce3 Ti 500, it doesn't cost an arm and a leg. You can pick up a PCI/PCMCIA card for as little as $100 and a base station for not much dearer. It is a matter of minutes to set up. But simplicity, in the 802.11b's case, is perhaps its Achilles' heel.

## Shortcomings

Security, for want of a better term, is lacking. The 802.11b standard uses WEP encryption. Two levels of WEP are commonly utilized (64-bit and 128-bit) but neither could pass for a Swiss bank. Both can be exploited by a zesty little program called AirSnort (running Linux with a 2.4 kernel and Prism-based NICS), which "materialized" recently on the Net. A WEP key is static, and this little blighter can crack it using only a short sample transmission. It's easy to see why some end users have gotten their knickers in a twist and why adoption for corporate users has lagged behind that of the consumer.

However, Dell jumped on the 802.11b bandwagon at an early stage. While Dell encourages customers to take a holistic, "end-to-end," approach to security and suggests that WEP's role in wireless network security has been overemphasized, the company actually uses off-the-shelf VPN technology to secure its wireless access. You can read our WLAN interview with Dell at www.cpumag.com/dec01/dell.

Firewalls may help, as will changing the WEP keys periodically on all wireless components. Basically, Network Admins need to use a bit of sense if WLAN is to be utilized for anything private or sensitive in nature.

Warning: You might never go back to a desktop.

## Range: 150 Feet Captain, Sir!

Far from permitting you to roam the streets of San Francisco, a wireless access point generally accommodates distances up to 150 feet. IEEE 802.11b signals range from 2.4000-2.4835GHz and use Direct Sequence Spread Spectrum (DSSS) radio signals, which pose a royal pain in the porkins for 2.4GHz cordless phone users. Also, the current performance ceiling of 11Mbps (often less) for WLAN cannot touch wired Gigabit Ethernet transmission speeds.

## Things Can Only Get Better...

I don't require high security or GbE and generally stay close to home, so for me the freedom of WLAN overshadows its shortcomings. I have my first tan since university, and the extra oxygen has surely gone to my head. Spring 2002 will see the introduction of 802.11a products from the likes of Intel and Dell, which can transmit /receive 54Mbps, five times that of 802.11b. There are promises of better security and less interference, too. On that note, I think I'll go back inside; it's getting chilly out here. Sure was a great sunset, though. . . . ■

***Cheers for listening. Feel free to nibble or throw me some chum at sharky@cpumag.com***

*Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.*

*This month the challenge is to build the* ***Best Granny PC for under $800.***

# Samit

When I set upon this endeavour—no, quest—to build the best Granny-ready PC for less than $800, I quickly decided on one thing: minimize technical support.

That's right, boys and girls. It took me years to wean my friends from calling me for PC help night and day. It was easy when I learned the secret: charge copiously for work performed without exception. Eventually the torrent of help requests slowed to a dribble and then nothing. Peace at last.

But building a system for my mum or dad carries the liability of madness where technical support is concerned. But I'm not known as Samit "Insidious" Choudhuri for nothing. First I thought to parlay my old, old game PC off as the Granny system. Hmm, I could pocket the $800 and make a run for the border. But that's been done. This seemingly easy assignment was becoming more difficult by the minute. What's an editor to do?

Then it hit me: buy everything from a local PC store. The benefits are threefold: (1) support your local PC shop, (B) minimize tech support calls to yours truly, and (III) save mucho dollars on shipping. So off I went to the D.I.T. Computers home page (www.ditcorp.com) where I customized and built a system but skipped the $100 assembly cost. I even got an OEM version of WinXP. No new upgrade from WinMe training sessions for me.

I went down the Intel road for the tops in stability and compatibility. Dropped in a solid 256MB PC133 in anticipation of WinXP and a 5400rpm Ultra ATA100 drive for my mum's grandkid photos (in case she manages to get me married off). Thought I'd donate my old copy of Microsoft Word 2000, download the latest copy of Zone Alarm, and root around for some antivirus software. Grabbed a bagel, lox, and cream cheese sandwich and banged the system together in an hour. Next I booted from the WinXP Home Edition installation CD-ROM and the rest was pud. Tested the system on my home cable network and it passed with flying colours. Even had money left over for beer—erm—flowers.

If I could change one thing, it would be the monitor. A 19-incher would have been better for her tired eyes. I'll have to tell Granny to watch for Sunday sales in her local paper; Office Depot had 19-inch Philips 109S20 CRTs on sale for $179 (after rebate), and CompUSA had an Envision EN-910 19-incher for $149. Deadlines prevented me the luxury of finding one in stock, but don't let that stop you, you little mama's boy. (Hey, I'm all about PC; I would never think of omitting mama's lil' girls.) ▲


| Component | Model | Price* |
|---|---|---|
| Case | SuperCase ATX Mid Tower 300 P4 | |
| Motherboard | BioStar Intel 815EP SKT 370 4X AGP | |
| Processor | Intel Pentium III 800EB (retail box) | |
| CPU Fan | Intel PIII FCPGA Cooling Fan | |
| Memory | 32X64 256MB 168-pin SDRAM 133MHz | |
| Hard Drive | 40GB Ultra ATA 100 5400 RPM | |
| Video Card | NVIDIA TnT2 M64 4X AGP 32MB | |
| Network Card | 32-bit PCI 10/100 SuperFast | |
| Modem | Intel Chipset 56.6Kbps fax/data/voice | |
| CD-ROM | Sony 52X IDE | |
| Diskette | 1.44MB Floppy Drive | |
| Speakers | KINYO 2-Piece Multimedia Speaker | |
| Mouse | DIT 1-Wheel 3D PS/2 | |
| Keyboard | DIT Multimedia PS/2 | |
| Software | Windows XP Home Edition (OEM) | |
| Miscellaneous | Direct Sound Ready AC97 Digital Audio Controller built onboard | |
| Subtotal | | $598 |
| Tax | | $ 38.87 |
| Monitor | 17-inch Envision EN-710 | $ 89.74 ** |
| Tax | | $ 9.75 |
| Actual Shipping | | $0 |
| **Total** | | **$736.36** |

*PC Components were purchased together for one price at D.I.T. Corporation.

**After $70 mail-in rebate at CompUSA


# Chad

I consider myself a good grandson and don't believe you can place a price on a grandma's love. Samit, however, insists the going rate is $800. Because part of that $800 has to go toward a monitor, I'm obviously on a very tight budget; most of my decisions revolved around the bottom line.

The good news is that most grandmas aren't much for Quake and are afraid to even breathe on a circuit board for fear of shorting it out. With this in mind, I decided to go the Micro-ATX route for my motherboard. For $77 I managed to secure a motherboard with integrated video and sound. The 750MHz AMD Duron processor and 128MB of RAM should provide Grandma with all the horsepower she needs. I don't see Grandma burning a lot of CDs or sitting at her PC watching "The Matrix," so I opted to save money again and get just a straight CD-ROM drive. The 20.4GB hard drive should provide Grandma with more than enough storage space. Throw in a generic modem and an affordable 17-inch monitor, and Grandma's set for hardware.

I wanted to make sure I had enough cash to put some decent software on the system. Many companies offer cheap software if you purchase hardware from them. Even with the discount, it pained me to pay $132 for Windows Me. (About 17% of my budget went for the OS.) If only Grandma were a Linux hacker, she would've gotten a printer. My version of Windows Me came with a "free" upgrade coupon for Windows XP. In this case, free means a $20 shipping and handling charge. (Maybe Microsoft should speak with AOL because they obviously know how to ship CDs for less than $20.) In addition, I added Microsoft Works Suite 2001, which includes Works 6.0, Word 2000, Picture It! Publishing 2001, Encarta 2001, Street & Trips 2001, and Money 2001. The suite should give Grandma plenty of new tools and let her use the PC for much more than just sending e-mail.

I think Grandma cares more about the tools than the MHz. Despite my limited budget, I think I put together a useful system. Not one I'd build for myself, but a useful system. ▲

| Component | Model | Price |
|---|---|---|
| Case | Enlight 7150 Mini Tower (MicroATX)* | $40 |
| Motherboard | Gigabyte GA-7VMM*** | $70 |
| Processor | AMD Duron 750MHz (OEM)** | $32 |
| CPU Fan | Mwave CPU Cooling Fan* | $6 |
| Memory | Micron 128MB SDRAM PC133 168P 16 x 64 7.5NS*** | $16.44 |
| Hard Drive | Fujitsu MPG3204AT 20.4GB 5400rpm** | $76 |
| Video Card | N/A (on motherboard) | |
| Sound Card | N/A (on motherboard) | |
| Modem | Generic 56Kbps*** | $10 |
| CD-ROM | Samsung 52X EIDE CD-ROM (OEM)*** | $29.12 |
| Diskette | Sony 1.44MB Floppy Drive*** | $10.86 |
| Speakers | Kinyo PS-230* | $8 |
| Mouse | AOPEN 2-Button PS/2 Mouse* | $5.90 |
| Keyboard | Mitsumi 104-key PS/2 Quiet Touch*** | $8 |
| Software | Windows Me ($132 with coupon for free XP upgrade), Norton AntiVirus ($12); Works Suite 2001 ($68)* | $212 |
| Miscellaneous | Thermal Grease ($2.95)** HDD Cable ($5.00)*; CD-ROM Cable ($2.00)* | $9.95 |
| Subtotals | | $534.27 |
| Tax | | N/A |
| Monitor | Viewsonic 17-inch E70* | $163 |
| Tax | | N/A |
| Actual Shipping | | $77.58 |
| **Total** | | **$774.85** |

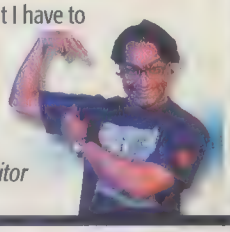
* Purchased from www.mwave.com
** Purchased from www.compubuzz.com
*** Purchased from www.wiredzone.com

## And The Winner Is . . .

Chad ordered all his parts from three online vendors, so shipping charges figured as part of the total, conceivably cutting in on the quality of Granny's goods. As Samit picked up the parts himself, he had no shipping costs and so was able to spend more on the PC.

Samit bought everything but the monitor from one local vendor, so Granny should have no trouble finding the right people to complain to if she has problems. Although the WinMe in Chad's system came with a coupon for a free WinXP upgrade, I liked that Samit's PC was already loaded and ready to go with XP Home Edition (OEM). I think Granny will appreciate this, too.

In the end, both of these systems will handle any jobs Grandmas will ask of them, but I have to give the win to Samit. His system has more RAM (256MB) and a bigger hard drive (40GB), and it came in about 40 bucks under Chad's creation. This will save your old(er) loved one precious bingo betting money.



Now if you'll excuse me, I'm off to enjoy the $40 dinner coupons that mysteriously appeared in my mailbox this morning. . . . *Jennie "The Judge" Schlueter, content editor*

# Swappin' Parts

## There's A Transformation Taking Place

For many computer users, upgrading a PC merely means buying a completely new system from some nerd at Best Buy for around $1,000. These PCs are worse than drinking lite beer, and a true PC guru probably wouldn't even consider buying one. After all, we're talking about a wimpy processor, a relatively small hard drive, only 128MB of RAM, and who knows what kind of motherboard. A true PC geek upgrades his or her own machine with the best parts he or she can buy.

Meet MERLE (Mediocre Electronic Refurbished Low-end Equipment). Each month, we'll gradually transform MERLE from a collection of past-their-prime components into a system that cooks, and in the process, illustrate the necessary steps for various upgrades

Being of geek ilk, we'll use this Swappin' Parts series as an avenue to upgrade a slow, out-of-date PC that we've dubbed MERLE (Mediocre Electronic Refurbished Low-end Equipment). When we're done, MERLE will be a powerful system that's as good or better than most PCs available off the rack. Each month, a *Computer Power User* writer will upgrade one of MERLE's components until this silicon trashcan resembles a PC we'd put in our own homes. This month, I'll upgrade MERLE's processor, probably the most important component in a PC. Before I do, though, let me introduce you to our MERLE, *Computer Power User's* sorry little test system.

### Our Humble PC

MERLE isn't a machine any self-respecting power user would willingly call his or her own. Most of MERLE's components are inadequate by today's standards. Check MERLE out.


After upgrading to an AMD 1.4GHz Athlon processor, the performance of our test system, MERLE, improved dramatically

**Motherboard.** We decided to use a Biostar M7VKD motherboard as the basis for MERLE. The ATX motherboard supports AMD Duron and Athlon processors from 700MHz to 1.4GHz. The motherboard has a 266MHz front side bus, uses the VIA VT8363 chipset, and supports up to 768MB of PC-133 SDRAM. There are five PCI slots, one AGP slot, two front and two rear USB ports, two serial ports, and one parallel port. The motherboard also has integrated audio. This Biostar motherboard is probably the only respectable piece of hardware in MERLE.

**Processor.** MERLE's original processor is an AMD 850MHz Duron, the less-expensive, less-powerful kin to the Athlon. An 850MHz CPU is serviceable for most PC tasks, but it's not what we want in our power PC. We're ditching it in favor of a 1.4GHz Athlon.

**RAM.** We installed 128MB of standard, ho-hum SDRAM in MERLE running at 133MHz using two 64MB DIMMs. 128MB is widely considered the minimum amount of RAM a user should have in his or her PC. Of course, the more RAM the better. We definitely need to add more RAM to MERLE soon.

**Hard drive.** The hard drives in almost all new PCs are 40GB or larger, spinning at 7,200rpms. MERLE's hard drive is just 10GB, which may be enough room to store your Andy Gibb or Metallica MP3s and a few good games, but not much more. Plus, the hard drive spins at only 5,400rpms. My head spins faster when I see a picture of J. Lo.

**Video card.** This is without a doubt the limpest piece of hardware inside

MERLE's case. We're using an ATI Xpert 98 AGP video card with a whopping 8MB of video memory. The card is a few generations behind the latest video card superstars, which have either 32MB or 64MB of DDR SDRAM and use fast GPUs to power graphics applications. Our video card can't even run the benchmarks we regularly use for 3-D graphics testing.

**Sound.** MERLE's motherboard has an integrated AC'97 audio chip, which is pretty common. The audio quality of such a chip is decent, but next month we're going to pull the plug on MERLE's integrated audio and replace it with some serious audio hardware. Stay tuned!

**Storage.** It seems every new PC has both a 16X DVD-ROM drive and CD-RW drive. MERLE has neither. We're using a 12X CD-ROM drive one of the lab techs probably found in a ditch near *Computer Power User* headquarters. We'd be lucky to get a box of Twinkies for this drive. MERLE also has a floppy diskette drive. Apparently, there's an unwritten law that every PC has to have a floppy drive, no matter how useless they become.

**Operating system.** A system as robust as MERLE probably deserves OS/2 Warp, but we don't have the stomach to do that to MERLE. Instead, we installed Windows Me. Someday this machine will be worthy of WinXP . . . someday.

## The "Before" Benchmarks

I had our testing lab run (or at least try to run) the benchmarks we use for PC reviews on our little MERLE. The system completed the SYSmark2001 and Video2000 benchmarks, but MERLE couldn't run the 3DMark2001 benchmark, which requires a video card with at least 32MB of RAM. Our video card in MERLE has only one-fourth that amount.

MERLE's SYSmark2001 scores were amazingly bad. The total score it charted was only 53, with an Office Productivity score of 54 and an Internet Content Creation score of 53. The SYSmark2001 scores are calibrated to an 800MHz Intel Pentium III system with 128MB of SDRAM, using a GeForce2 video card. A score of 100 is equal to the performance of the 800MHz system, so you can see that MERLE is pretty weak by comparison. The Video2000 total score was 1,513, which also isn't good. I recently tested a 2GHz-charged system that notched an Overall SYSmark2001 score of 189, with an Office Productivity score of 173 and an Internet Content Creation score of 207. Almost all Video2000 scores I've seen on new PCs in the past few months have topped 2,000, or at least come very close.

**MERLE'S SYSmark2001 scores were amazingly BAD.**

## Install The CPU

Installing a new processor is easy to do and only takes a few minutes. In fact, you may spend more time removing components from your PC to reach the processor you want to replace than you do actually changing the processors. I had to remove the power supply and video card in MERLE to remove the CPU. Some of you have replaced a processor or two in your time, but I'll describe the steps I went through for those who haven't.

First, I shut down and unplugged the PC, which, of course, is always Step 1 whenever you upgrade an internal component. Next, I opened the case and located the processor, which was conveniently seated directly behind the power supply. I removed the power supply and popped out the video card, which gave me just enough working space to reach the processor. The CPU installed in MERLE had a heat sink and fan unit attached to it, which I unplugged.

MERLE's heat sink and fan unit was clipped to the processor's socket to help anchor it into place, so I popped the clips off the lugs and removed the heat sink and fan unit. I pushed the socket's ZIF release lever out and up so it was at a 90-degree angle.

I aligned the pins on the underside of the new 1.4GHz Athlon to the empty socket and inserted the CPU into place. I put the release lever back into its original position, which locks down the CPU. Next, I placed the included heat sink and fan unit on top of the processor and locked the clips onto the socket's lugs. This was a little tricky because I had barely enough room to move my trunklike fingers into position. I did manage to pop the unit onto the socket after a couple of tries. I then plugged in the CPU's cooling fan, reinstalled the power supply and video card, and plugged in the PC. It was then time to rerun the benchmarks to see how much of a performance gain the upgrade would provide.

## The "After" Benchmarks

What a difference a good processor makes. The SYSmark2001 scores were significantly higher after the upgrade to the 1.4GHz processor. The Overall score was 72, which is a 35% increase in performance. The Office Productivity score was a 22% gain from the original score. The Internet Content Creation score of 79 was the biggest increase, however, representing a 49% performance increase. The improvement in the Video2000 score wasn't as significant. The new total score was 1,572, only 59 points higher than the previous Video2000 score. This isn't surprising, though, as this score relies primarily on the performance of the video card.

You can improve a system's performance in several ways, but upgrading the processor may be the best way to go. It's an easy upgrade, and the overall performance boost is likely to be significant. CPU

**by Michael Sweet**

# X-ray Vision: ATI SmartShader

You know the key to gaming success: speed and flexibility. Your character can't dodge and strike opponents unless you can reach and press your joystick buttons fast enough. Your thumb-stretching exercise secrets give you the edge.

What a crock, then, that your GPU and CPU can't match your flexibility and speed. Sure, GPUs are great at creating complex graphical 3-D images, and CPUs do an admirable job of processing a variety of complex computing tasks, from running the operating system to the gaming logic. But neither type of chip offers the kind of flexibility many game developers crave.

ATI is giving developers a break with its SmartShader technology, part of the Radeon 8500 GPU and part of DirectX 8.1 and future versions. SmartShader gives GPUs and CPUs the flexibility and speed they need to put a completely new face on graphics. PC game developers can use SmartShader capabilities to approach graphics and special effects techniques previously only available in movies.

Using anisotropic lighting, the Radeon 8500 can simulate a brushed metallic surface on the chalice in this image. SmartShader technology makes it possible to draw this image in one rendering pass.

## 3-D Graphics Pipeline

| | | |
|---|---|---|
| Geometry Processing Phase | Vertex Data | All 3-D graphical images are loaded into the graphics pipeline as vertices, containing data about their position, color, and texture. |
| | Truform* | |
| | Higher Order Surface Tesselation (optional) | Once in the Geometry Processing phase, if needed, the pipeline performs tessellation on the graphical images, in which 3-D images become high-polygon images with smooth edges. |
| | Vertex Shader | In the vertex shader, developers can call new processing technologies using SmartShader to create more realistic or special-effect images, such as the waver of a soap bubble in the air. |
| | Charisma Engine II* | |
| | Backface Culling/Clipping/ Viewpoint transform | Finally, with backface culling, clipping, and viewport transform, the 3-D graphics data undergoes hardware geometry acceleration, preparing the vertices for display. The vertices then move to the Rendering phase, where the pipeline converts them to pixels. |
| | Hyperz II* | |
| Rendering Phase | Triangle Setup | In the triangle setup phase, the pipeline links the vertices together to create triangles. |
| | Pixel Shader | In the pixel shader, developers can use SmartShader to add cool effects, such as lighting from multiple sources or specialized light reflections. |
| | Pixel Tapestry II* | |
| | Fog Blending/ Visability Testing | Finally, the pipeline applies special effects to the pixels, including fog blending (if needed). The pipeline then determines whether each pixel is hidden, partially visible, or fully visible through visibility testing. |
| | Smoothvision* | |
| | Video Immersion II* | In the frame buffer, the pipeline writes the final color and data for each pixel to the frame buffer. The completed image now travels to the display device (or runs though the pipeline again for additional processing). |
| | Frame Buffer | |

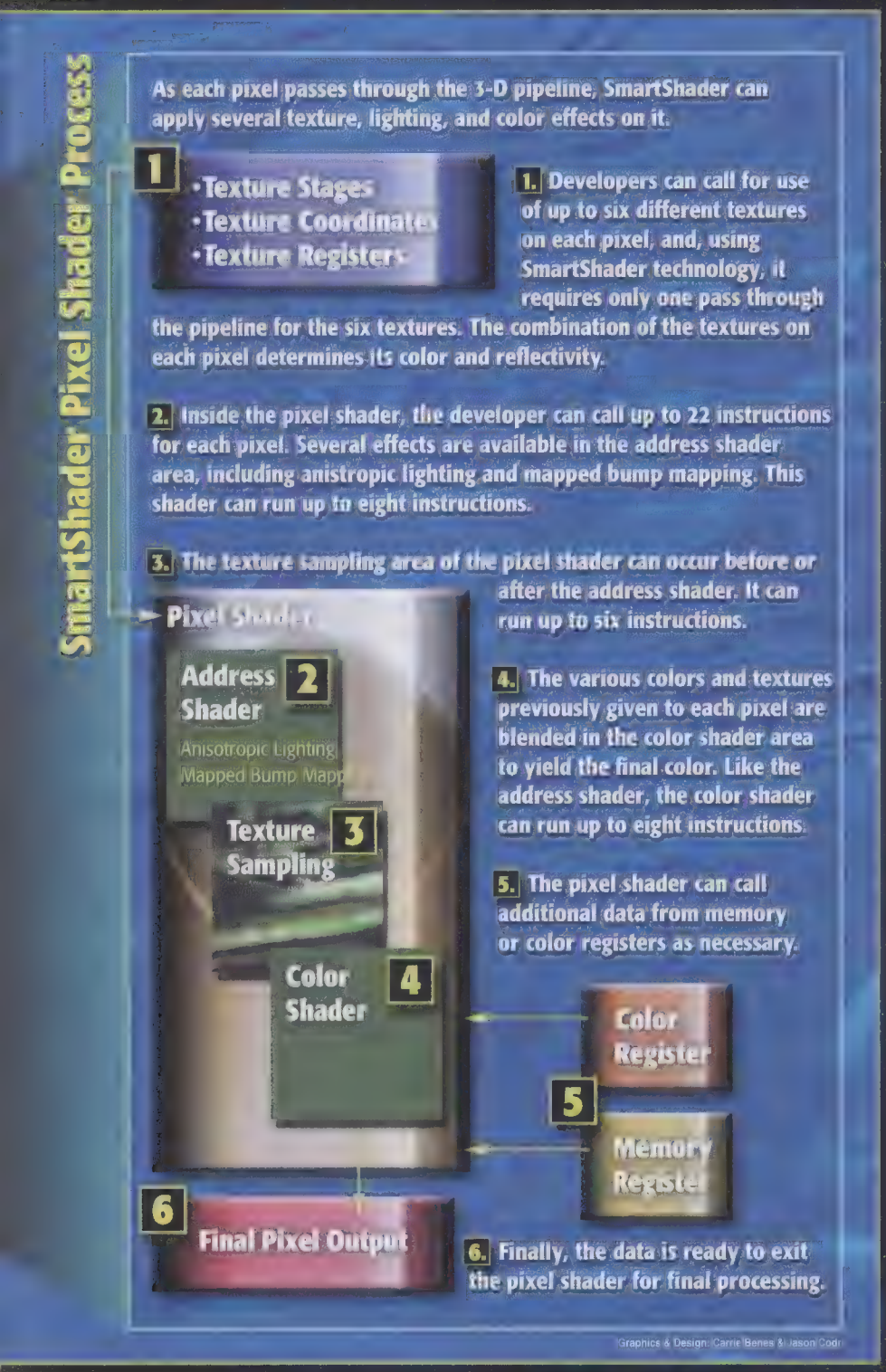
* See "The Rest Of The Radeon 8500" sidebar

### A Quick Fix

Graphics APIs let developers call fixed functions and have the GPU draw them quickly on-screen. Chipmakers manufactured GPUs to incorporate the API fixed functions, letting them focus on one instruction set and execute it quickly.

Because of the specialization manufacturers build into GPUs, however, incorporating new features and techniques can be difficult; chip manufacturers must build support for the new feature into the chip technology, and developers have to incorporate support into the software. Graphics developers must wait until all of the pieces are in place before they can use the new features in games. Consequently, the CPU has usually had to calculate any custom vertex and pixel lighting options, which caused overall system impotency.

By using shaders (programs developers can construct to control graphics creation) and technologies such as SmartShader in graphics cards, developers can bypass some of the delays in improvements in graphics hardware, giving developers better flexibility in adopting new techniques. Shaders won't run as smoothly or as quickly as a fixed function version, but they do provide faster implementation of improvements.




### Graphics Pipelines

Vertex shaders perform their work early in the graphics-processing pipeline. As the data for creating each pixel enters the pipeline, the developer can call the vertex shaders to perform the necessary operations on each vertex. SmartShader's vertex shaders permit up to 16 pieces of data per vertex, providing great graphical detail for position, texture, and lighting.

After the 3-D graphics pipeline processes the vertices (called the geometry processing phase), it moves to pixel processing in the rendering phase. The developer can call pixel shaders to perform various tasks on the vertices, such as texturing, filtering, and blending. SmartShader's pixel shaders take advantage of three graphics pipelines to let developers apply up to six textures in one rendering pass. Past graphics rendering technologies needed multiple passes to achieve such realistic textures.

SmartShader means fewer instructions can yield the same or better graphical results. Because the GPU must execute tens of millions of pixel shaders per second to maintain a smooth frame rate, letting application of multiple textures in a single rendering pass gives developers more options without killing frame rate speed.

### DirectX 8.0 vs. 8.1

ATI has worked closely with Microsoft to improve upon the vertex shader and

**DirectX 8.0 pixel shader maximums**

- **4** Texture inputs
- **4** Texture sampling instructions
- **8** Color blending instructions
- **0** Texture addressing instructions

**DirectX 8.1/SmartShader pixel shader maximums**

- **6** Texture inputs
- **6** Texture sampling instructions
- **8** Color blending instructions
- **8** Texture addressing instructions

pixel shader technologies found in DirectX 8.0. The SmartShader technology gives developers using DirectX 8.1, which should be part of Windows XP, unprecedented graphics capabilities. SmartShader also works with OpenGL.

"Last fall, we had some time to look at [DirectX 8.0] and see some of the areas where it was a bit weak," says David Nalasco, ATI's technical marketing manager for desktop graphics.

DirectX 8.0's vertex shader support is more complex than its pixel shader support: maximum program length for vertex shaders is 128 instructions vs. 12 instructions for pixel shaders. With that data, ATI decided to focus SmartShader technology on improving pixel shader support. In DirectX 8.1 and SmartShader, pixel shader maximum program length increased to 22 instructions.

## In Case You Didn't Know

- **Anisotropic lighting** is a graphics rendering technique developers use to show the reflection of light off surfaces consisting of many strands or particles, such as hair.
- A **fixed function** effect is a command or technique hard-wired into a GPU.
- A **gigatexel** is equal to one billion filtered textured pixels.
- A **megatexel** is equal to one million filtered textured pixels.
- **Pixel data** is information the software and GPU pass to the display device that spell out the color and reflectivity of each pixel, or dot, that makes up the graphic.
- **Vertex data** is similar to pixel data, but it spells out the shape and position of the triangles that make up the overall graphic.

"Look at vertex shaders; they can be very complex," Nalasco says. "Compare that to pixel shaders, and you have only about one-tenth the complexity. It was just a lot more restricted."

**Radeon 8500 basics**

- 250MHz core clock speed
- 275MHz memory clock speed
- 64MB DDR memory
- 2,048 x 1,536 max resolution at 32-bit color
- Available for PC and Mac
- $399 MSRP

### Where's The Theater?

Using shader technology, Nalasco says effects and techniques previously only available to moviemakers should begin appearing in gaming design. Nalasco knows ATI's Radeon 8500 and SmartShader technology will give developers some awesome new technologies; he can't wait to see how developers use them.

"With shaders, we give people the ability to program graphics chips to do whatever they want," Nalasco says. "Now the graphics features we are able to support are only limited by what people can do. . . . We're not really sure yet of what's going to be possible." CPU

by Kyle Schurman

*See more about the ATI SmartShader technology at www.smartcomputing.com/cpumag/dec01/smartshader.*

## The Rest Of The Radeon 8500

In addition to SmartShader technology, the Radeon 8500 GPU introduces several new and improved 3-D graphics technologies.

**Charisma Engine II**
Using this technology, the Radeon 8500 can process 62.5 million triangles per second with full T&L capabilities.

**Hyperz II**
Rendering performance improves by about 25% through use of Hyperz II, which conserves memory bandwidth by discarding hidden pixels more quickly and by compressing data more efficiently.

**Pixel Tapestry II**
The Radeon 8500 can process 2 gigatexels per second in 32-bit color using Pixel Tapestry II.

**SmoothVision**
Using improved anti-aliasing methods, SmoothVision works on post-processed graphics to smooth edges and jagged lines, further improving them before displaying them. Developers can program their own pixel sampling patterns using SmoothVision.

**Truform**
ATI's Truform technology processes 3-D data coming from the software before it reaches the GPU, converting it from triangles to curved surface data. Curved surfaces yield more realistic silhouettes and lighting than are available with triangle surfaces, and 3-D models require less bandwidth when rendered with curved surfaces. Through Truform, developers will see more realistic images with minimal loss of performance. Truform supports backward compatibility with existing graphics hardware.

**Video Immersion II**
Users will find improved video quality and improved DVD playback support in the Radeon 8500, thanks to Video Immersion II.

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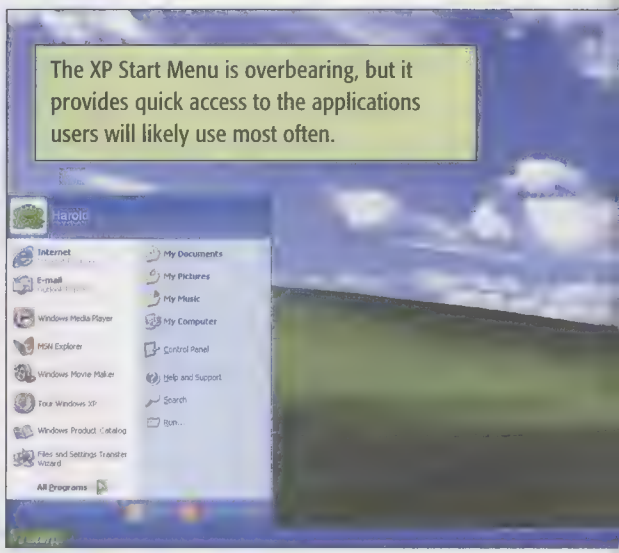
# Breaking Down XP

## Our Take On Microsoft's Latest OS




By now, it's pretty well known to most of us that Windows XP (www.microsoft.com/windowsxp) is Microsoft's insurmountable Next Big Thing. Regardless of antitrust decisions and appeals, Product Activation and Passport controversies, and how users feel about XP's new-and (allegedly)-improved interface, XP is destined for ubiquity. The combined XP marketing campaign for Microsoft, Intel, OEMs, and retailers reportedly totals around $1 billion.

Beginning with the first beta release, most reports have indicated that XP is solid and a worthwhile upgrade, with the possible exception of those organizations that have recently implemented Windows 2000. Our lab techs installed the gold beta XP Home and Professional editions on three PCs for testing, and we put the OS through the paces.

### First Impressions

With XP, Microsoft takes a stab at clearing off the Desktop, especially with the Professional edition. Most items formerly on the Desktop now reside in the largely expanded Start menu, which is probably the most noticeable cosmetic revision. If the sparse Desktop is too shocking, you can resurrect My Documents, My Computer, My Network Places, and Internet Explorer icons. To do this, right-click the Desktop and enter the Properties to customize the appropriate selections.

XP's default Desktop theme, Luna, is nice eye candy, but it doesn't leave room for customization. Other themes are available, though. Choosing Windows Classic lets you tweak away. Unfortunately, Microsoft has yet to clamp down on those torturous color combinations some officemates prefer. The Desktop background image and screensaver are your choice.

XP's applications have a browserlike feel. Windows Explorer and Help And Support even have Back and Forward buttons. We like the new look, but the Help And Support and Find features force you to jump through selection hoops to find what you are looking for. And regardless of whether you use the default theme or revert to Windows Classic, the too-busy Start menu layout remains the same.

### Under The Hood

XP turns to Microsoft's NT kernel, leaving the Windows 9x/Me family behind. This enables multiple-user logins (each accompanied by a cutesy graphic) in both the Home and Professional editions. Home users will like using separate logins; after logging off and then back on, all running programs are still open in the exact state they were left.

The most obvious changes in XP are more than cosmetic. DOS is officially really dead. Well, almost. XP is a totally 32-bit OS, but it's still capable of running old software as if it were a previous Windows incarnation; it can even run some old DOS programs in emulation mode. To do this, right-click the executable file and click Properties. Under Compatibility Mode, check Run This Program In Compatibility Mode For and select the appropriate OS.

Conversely, XP won't run many DOS programs. Also, XP leaves ISA cards in the dust. Other limitations include support for IEEE 1394 and USB 1.1 products, but not for USB 2.0. Microsoft plans to offer USB 2.0 support in the near future, possibly as a Windows Update. Another caveat is XP and IE 6 don't support the latest Java applications. The ones they do support are more than four years old. At press time, most OEMs weren't actively addressing this issue for new XP machines.

### Improved Multimedia

One of the more striking revamps in XP is the new Windows Media Player 8. Combined with the presence of the new Windows Messenger—an audiovisual online communication app that rivals the likes of Yahoo! Messenger—there's no mistaking that Microsoft is aiming high in multimedia and online communication.

The Windows Media Player codec lets you copy audio files from a CD or the Internet in Microsoft's WMA format. Shortly before XP's release, Microsoft shrewdly added support for MP3 encoding, as well. Microsoft claims WMA maintains high quality with files but occupies half the space equivalent MP3 files require.

In addition, Windows Media Player 8 can rip WMA and MP3 files to CD-R/RW media and play back full-screen DVDs. Other cool features include automatic (if you're online) album art, playlists, and lyrics. We played more than a dozen audio CDs, and Microsoft delivered correct information for all but one classical and one jazz title; each was designated as "unknown." The feature fared best with rock selections. We were impressed with Windows Media Player's range and even more impressed that it didn't slow down the system.

Microsoft also enhanced Windows Movie Maker for XP. If your system meets XP's system requirements and has 1.5GB hard drive space available, you can use Movie Maker to capture video from videotape or digital media and edit, organize, and even compress it. We didn't test this capability, but Microsoft claims 1GB hard drive space accommodates more than 20 hours of compressed video.

### Simplified Desktop Management

Network administrators should love working with XP Professional, and the organization's employees using Pro will likely be happy with XP's hot docking and offsite network mirror feature. They might begrudge the greater control administrators will have over their Desktops, however.

Much of the hype about Desktop management relates to XP's new uses for IntelliMirror technology, introduced in Win2000 and enhanced for XP. A number of features reside beneath the IntelliMirror umbrella, which maintains a mirror copy of all user data. This feature benefits network administrators and client users alike, but employees might bristle that individual Desktop settings and directories once confined to each individual's local drive are now network-accessible.

IntelliMirror and its related features let individual programs and settings "roam" with each user. This lets users log in at any network-connected PC and find their work exactly as they left it, which is especially good news for those using notebooks on the road. Additionally, should the network go down, users can access all their files and directories locally; after reconnecting with the network, those files and directories are automatically synchronized. Mapped network drivers, however, can't roam as yet; Microsoft claims this ability will be added soon.

Network administrators should like XP's Active Directory, Group Policy, and RIS (Remote Installation Service) features. Active Directory lets administrators manage users, clients, and servers across the network, bringing software installation, exchange server, and network device management under unified control. Group Policy lets network admins assign

## XP Controversy Updates

It's not surprising that XP has been controversy-laden since the first beta copies trickled out to reviewers and analysts. Only time will tell if the most-heated debates about XP, especially those about full raw sockets, will make the most-frothy analysts look like tech prophets or Chicken Littles. We revisited three issues raised during beta cycles and still abuzz around XP's official release.

| | The Critics' Take | Microsoft Responds |
|---|---|---|
| Product Activation | Many analysts have criticized Product Activation technology as being overly intrusive and controlling, especially for users who make frequent hardware configuration changes. The feature "is not bulletproof by any means," says Steve Gibson, president of Gibson Research Corporation (www.grc.com). "Microsoft knows that it can't create a nonhackable solution. So the idea is for the WPA technology to thwart casual piracy. I am sure it will succeed in doing that." | "There are various types of software piracy," a Microsoft spokesperson explained to us, "including miss-channeling, counterfeiting, and casual copying. [Product Activation] is designed to curb casual copying." Product Activation technology requires users to activate XP after the initial installation and reactivate the OS after making a significant number of hardware configuration changes. |
| Passport and .NET My Services | Passport technology has been under fire from many privacy advocates because it takes on a larger role in XP, with its implementation being a prerequisite to using Windows Messenger. "Whatever the technical merits of Windows XP," says Jason Catlett, president of Junkbusters (www.junk busters.com), an online privacy advocacy firm, "Microsoft shouldn't be allowed to use it to coerce and trick its users into surrendering personal information. Microsoft should be prohibited from using personal data unfairly." | A type of e-wallet, Passport is intended to simplify Web surfing by keeping passwords and other often-entered personal information in a central location. According to a Microsoft spokesperson, "With Passport, consumers are in control of what information, if any, to share with participating sites. . . . Microsoft and Passport are very clear about the privacy policies that govern the use of information collection and use. Passport does not use the personal information stored in a Passport profile for any purpose other than the operation of the Passport service. The company does not sell, lease, or rent this information. Expanded use of Passport, with .NET My Services, is within a completely opt-in environment." |
| Full Raw Sockets | According to Gibson, a vocal critic of raw sockets from the outset, the implementation of raw sockets makes machines running XP vulnerable to hacker invasion, and therefore "able to easily generate malicious Internet traffic. Thus, hackers will trick XP users into downloading malicious 'Trojans' or 'zombies' in order to commandeer those powerful machines and use them to attack innocent third parties." | Microsoft has repeatedly denied the full raw sockets API used in XP pose a significant security risk. The company claims the implementation of raw sockets doesn't make gaining control of a PC any easier, and hackers can implement raw sockets themselves after gaining control of a PC because, by default, XP users have administrator rights to modify their systems. And besides, raw sockets were already implemented in WinNT and Win2000. |

computer and user configurations for groups or individuals, and RIS simplifies network-wide OS installation.

### Safety Nets

Microsoft has beefed up security for XP, removing the most obvious possibilities for causing inadvertent damage to the OS. By default, system files are hidden, which may annoy users who know what they're doing. But we appreciate the ease with which you can click through warnings to quickly get to desired files. The same goes for modifying system files.

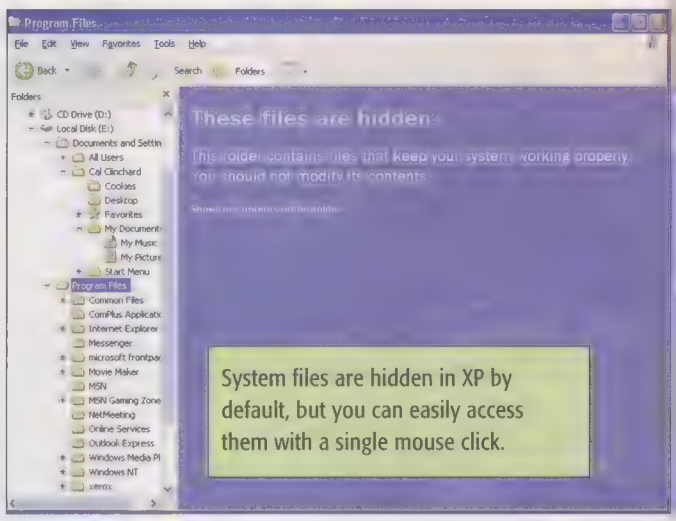
XP's System Restore feature essentially lets you back up system files, so if future changes don't work as planned, you can reapply earlier system files to restore the system to a former state. This worked well in our tests and didn't mess with nonsystem files, such as Word documents.

In a crunch, the Remote Assistant feature lets another party access and control the PC via an Internet connection. This requires using Windows Messenger, which means you must be a registered Passport user (see the "XP Controversy Updates" sidebar in this article). Remote Assistant hasn't stirred up security advocates because users must extend an invitation and establish a password with an expiration time to use the feature.

### Unsolicited Guidance

XP is infused with an arsenal of pop-up dialog boxes that explain what Microsoft wants you to know or do. For example, each time you access the Internet, a dialog box declares, "My connection is now connected." Also, until you activate XP, a dialog box at each logon states the days remaining until the activation deadline arrives.

XP also repeatedly asks if you want to perform Windows Updates. With an active Internet connection, Windows Updates automatically provide the latest driver updates and application and device-compatibility updates. These nudges are helpful, but we were relieved that Microsoft decided against incorporating Smart Tags into XP and IE 6. Smart Tags still exist in Office XP, offering links to Web sites that Microsoft recommends, a sure-fire dud with analysts early in the beta game.




System files are hidden in XP by default, but you can easily access them with a single mouse click.

### Product Activation

Intended to clamp down on piracy, Microsoft implemented Product Activation

## Benchmarking XP

We installed XP Home and Professional editions on three systems, including an IBM PC 300 GL with a 530MHz PIII processor, 128MB of RAM, and 13GB hard drive; a MicronPC Millennia Max XP2 with an Athlon 1.2GHz Thunderbird, 256MB of RAM, and 40GB hard drive; and an IBM NetVista M41 with a 2GHz Pentium 4 processor, 128MB of RAM, and 40GB hard drive. We ran BAPCo's SYSmark2001, which yields Internet Content Creation and Office Productivity scores. For details about SYSmark2001 scoring, including comparative scores charted, visit www.bapco.com.

| | IBM 530MHz Pentium III | | MicronPC 1.4GHz Athlon | | IBM 2GHz Pentium 4 | |
|---|---|---|---|---|---|---|
| | Home Edition | Professional | Home Edition | Professional | Home Edition | Professional |
| **SYSmark2001 Benchmarks** | | | | | | |
| SYSmark2001 Rating | 56 | 56 | 157 | 159 | 156 | 155 |
| Internet Content Creation | 55 | 55 | 153 | 153 | 137 | 135 |
| Office Productivity | 58 | 58 | 161 | 166 | 178 | 178 |
| **Other Testing (all in seconds)** | | | | | | |
| Cold Boot | 57 | 53 | 30 | 30 | 36 | 43 |
| Restart | 65 | 60 | 41 | 52 | 49 | 51 |
| Switch User | 4 | 4 | 2 | 2 | 2 | 2 |
| Recover From Standby Mode | 10 | 7 | 9 | 13 | 13 | 10 |
| Shut Down | 12 | 16 | 13 | 30 | 12 | 12 |

technology with XP. This requires new users to activate their XP copies via the Internet or telephone, and it also requires reactivation if users make a certain number and certain type of hardware configuration changes. If activation and reactivation aren't performed in time, XP stops working until the user acquires a Confirmation ID from Microsoft by telephone.

Since the first announcement of Product Activation, Microsoft has relented on some stiffer requirements to appease user concerns. Microsoft extended the initial activation period to 60 days and let up on what it considers "significant" hardware changes. Under the modified policy, if a PC doesn't have a network adapter, or if the network adapter has been changed, three hardware devices can be changed before reactivation is required. If a PC has a network adapter and it has never been changed, five hardware devices can be changed.

Users can reactivate XP via the Internet when required due to a significant hardware change only if 120 days or more have passed since the previous activation. If less than 120 days have passed, reactivation must occur via telephone. This is where the grumbling begins, because activation and reactivation via telephone means reciting an Installation ID number and receiving a 42-digit Confirmation ID. Trust us, activate and reactivate using the Internet; it is a piece of cake. (See the "XP Controversy Updates" sidebar for more.)

### Buying XP

XP Home Edition is available as a $99 upgrade or for $199 standard. The Professional edition is a $199 upgrade or $299 standard. Office XP is sold separately for $479 standard or $579 professional. Microsoft recently announced an educational discount, with Office XP Standard available to students and teachers for $149 in retail outlets.

As we were going to press, Microsoft announced it would extend its enterprise upgrade discount offer, part of the older-and-gentler Version Upgrades program, to July 31, 2002. After that date, Version Upgrades won't be available. The new enterprise upgrade program, Software Assurance, gives enterprises a choice: Keep your current OS; pay full purchase price for a new OS; or buy a three-year subscription and receive each new OS Microsoft releases.

## Recommendations

Here's a look at installation recommendations Microsoft suggested with its gold prerelease version of XP, along with our recommendations.

| | Microsoft Recommends | CPU Recommends |
|---|---|---|
| **Hardware** | | |
| Processor | 300MHz Intel Pentium II-compatible or higher | Expect decent performance at 300MHz, but go for more gusto to move things along more quickly. |
| RAM | 128MB (64MB minimum) | 64MB might satisfy nonpower users but 128MB is better. |
| Hard Drive Space | 2GB | XP hogs more hard drive space than any previous Windows OS, so this recommendation is prudent. In fact, go larger if you're able. |
| Monitor | SVGA (800 x 600) PnP | It barely matters to XP the monitor you use, so use your own discretion here. |
| Video Card | No recommendation | A PCI card will work fine for the basics, but an AGP card is a must for anything complex. |
| Drives | CD-ROM or DVD-ROM, 12X or faster | A CD-RW drive will let you rip CDs with Windows Media Player 8. |
| Connections | Network adapter or Internet access | Although not required, Microsoft "strongly recommends" these connection types so you can use the Internet for Product Activation and Windows Update. |
| **Installation** | | |
| File System | NTFS, unless you'll run apps on multiple OSes, in which case either FAT or FAT32 will work | Agreed. NTFS is far superior, but multiple OSes requires FAT or FAT32. If you choose NTFS but need to go back to FAT or FAT32, you'll have to reformat the drive or partition first. |

### A Final, Unscientific Note

In addition to running technical tests, we installed the gold copy of XP Home Edition on an unnetworked IBM PC with a 667MHz Pentium III processor and 192MB of RAM as an upgrade to WinMe. We threw all types of software at it, most of it designed for XP. The software ran like a dream. The same PC using WinMe occasionally locked up running some multimedia applications, including Windows Media Player 7. XP hasn't caused a single system hiccup, and it even runs Lotus SmartSuite 9.6, which isn't supposed to work on XP. Additional testing has only bolstered our favorable opinion of the new OS.

*For a look at specific PCs major manufacturers plan to or are already shipping, see our "Systems Shipping XP" sidebar at www.smartcomputing.com/cpumag.com/dec01/xpsystems. Also, see the "Home Vs. Pro" sidebar at www.smartcomputing.com/cpumag/dec01/homevpro to see how the editions compare.* CPU

**by Cal Clinchard**

# Windows XP Apps

## Milk Your New OS For All It's Worth

Windows XP is undoubtedly the most powerful, feature-rich, and stable consumer OS Microsoft has ever released, but it's still far from perfect. Most of the new integrated features are fine for Mom and Pop, but they don't offer the features power users crave; that's where the applications and utilities designed specifically for WinXP come in. There are bound to be many more than those described here by the time XP hits the shelves, but the following are indispensable for those who spend much of their day interacting with Windows.

### Detonator XP Drivers

WinXP comes with better hardware support than any previous Windows OS, but that doesn't mean the drivers with which it ships are necessarily ideal. If you have an NVIDIA-based video card, especially anything from the GeForce line, get to NVIDIA's Web site posthaste to download the Free Detonator XP (www.nvidia.com) drivers. They provide a nice performance boost and solve a lot of problems with games, especially those that rely on the OpenGL API.

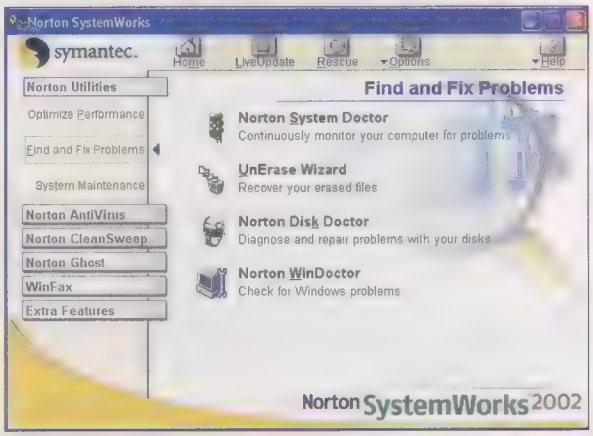
### Easy CD Creator 5.1

XP incorporates a neutered version of Roxio's popular Easy CD Creator (www.roxio.com) burning software, but power users aren't going to settle for something integrated into the OS. XP is not compatible with Easy CD Creator 5, so be sure to download the free WinXP compatibility upgrade or purchase the WinXP-compatible version of Easy CD Creator 5 Platinum ($100) once XP is installed. That will add all the CD recording features current 5.0 users enjoy, including Spin Doctor and a slick label and jewel box insert creation program.

### ItweakU

WinXP has arguably the best user interface of any consumer OS, past or present, but some settings are tough to adjust without knowing every menu and submenu. Make things easier on yourself with PJF Data's ItweakU (www.jockesoft.com/itweaku.asp), a freeware gem that lets you control the way XP looks and acts.

You can hide folders, clean up your Start menu, alphabetize your Favorites folder with a single click, rebuild icons, use Windows Update without registering, and get rid of just about anything that's annoying you. If that's not enough, the $20 Professional version offers a host of other enhancements, including Web tools and access to security settings.




Symantec's Norton SystemWorks 2002 is the latest version of the venerable utility suite.

### Microsoft Plus! for WinXP

Microsoft's popular Plus! Pack (www.microsoft.com) is back, this time designed specifically to enhance WinXP. For $40 you get an audio converter that automatically crunches all your MP3 files into WMA format, a bundle of Windows Media Player skins, new high-res screen savers, and new themes. Other features include games and a variety of digital media enhancements, such as voice-control for Windows Media Player and a speaker configuration program that optimizes sound output based on the brand and number of speakers you use.

### Norton SystemWorks 2002

At the time of XP's October release date, most of Symantec's utilities were XP-compatible, including its $70 SystemWorks 2002 (www.symantec.com) suite. A Professional version that includes Norton Ghost and WinFax Basic sells for $99

SystemWorks is known for its system optimization tools, and Symantec updated those tools to squeeze more performance out of Microsoft's new OS. Some applications and utilities are disabled, however. I first tested SystemWorks 2002 on Windows Me. After upgrading to WinXP a few tools were grayed-out and inaccessible, including Speed Disk and the Wipe Info utility. Symantec likely will patch this stuff soon after WinXP hits retail, but if these features are important to you, check carefully before making a purchase.

### WindowBlinds XP

One nice thing about XP is that it's easily skinnable. No more square corners and drab windows. Unfortunately, installing and managing these themes is a chore, unless you use a program, such as Stardock's $20 WindowBlinds (www.windowblinds.net). The utility offers native WinXP support and integrates seamlessly with the OS. The software also adds a WB Settings button that lets you choose the elements of Windows you want to skin and deselect those you want to leave alone.

Once you grab WindowBlinds, visit WinCustomize (www.wincustomize.com) and browse thousands of skins, icons, and other interface graphics to personalize your copy of XP. You can make skins with Stardock's SkinStudio (www.stardock.com) for about $20, or save money and subscribe to the Stardock's ObjectDesktop suite, which includes all these programs and more for $50 a year. CPU

**by Tracy Baker**

# room to burn


Get organized, and take your files with you wherever you go. Burn all your data, video, photography, MP3s, vinyl, cassettes and whatever else you've got to CD with Easy CD Creator® 5 Platinum, from Roxio. The best selling CD burning software in the world. You can even create your own personalized jewel cases for each disc. Hit roxio.com to find out how. Mac users check out Toast® 5.

*Now Windows® XP compatible.*

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DIGITAL VIDEO
DATA BACKUP
ORIGINAL MUSIC
DIGITAL PHOTO
MP3

roxio

The Apple faithful have been waiting for this since 1987, when Apple announced it was working on a new, modern operating system, code name Pink, that would bring such features as pre-emptive multitasking and modern memory management to the desktop. Pink never quite saw the light of day.

The faithful waited through Taligent, which promised to bring pre-emptive multitasking and modern memory management to the desktop. We waited through Copland and then Rhapsody, which promised...well, you know the drill. Finally, it's here. Apple has delivered the promised modern OS, one that, surprisingly, is based on an old operating system from the 1970s: Unix.

Since its introduction in March 2001, OS X (we know; it sounds cooler as "ex," but it's "ten") has already undergone a few minor revisions. But first things first: Here's our take on version 10.0.4, which was the most current version when we went to press, with an eye toward stability and performance. Check out the "What's New In 10.1" sidebar if you want to know what's coming in the upcoming 10.1 release, which we expected to be available by late September at press time.

# Mac OS X

## Apple Finally Makes Good On Its Promise

### The Apple's Core

We tested 10.0.4 on a dual 800MHz Quicksilver G4 with 640MB of RAM and two 60GB Maxtor 7,200rpm drives. This configuration from Apple currently comes with OS 9.2.1 and OS X 10.0.4.

In a word, the Apple OS X is impressive. We know we'll get heat from Linux users, but Apple may well have done what Linux has been unable to do: put Unix on desktop machines for ordinary people to use productively. To do so, Apple combined a Mach 3.0 microkernel with the FreeBSD 3.2 version of Unix. Together, these components make up the core of OS X, an open-source kernel called Darwin. Darwin is a very flexible base that you can even recompile to run on alternate processors. To this base Apple added a display layer, replacing the old QuickDraw routines with OpenGL, a standard for 3-D graphics; Quartz, based on Adobe's PDF technology for 2-D; and QuickTime for multimedia.

Applications can run in one of three environments: Classic, Carbon, and Cocoa. Classic, a Mac OS 9.x environment, lets most OS 9.x applications run unchanged but without the new OS features available. Carbon uses common programming models such as Pascal, C, and C++. Programs written in Carbon can run under OS 9.x as well as OS X. Cocoa is an implementation of Java and Objective-C; its programs can only run under OS X.

Apple also added the Aqua toolbox, a collection of routines that applications call on to interface with the user. Because Aqua sits above the other layers of OS X, it can inherit any of the functionality of lower levels, including the ability to integrate QuickTime multimedia, as well as 2-D and 3-D rendering. This ability gives Aqua much greater capabilities than Mac's old user interface.

### Stability

To put it bluntly, OS X is the most stable OS we've ever run, including Win2000. What comes in second? A variant of Unix called Domain that was used on Apollo Computers, a workstation manufacturer that competed with Sun; Hewlett-Packard later bought it.

We've been using OS X since the first public beta and have had one kernel panic occur in approximately a year. Kernel panics are system crashes that bring down the OS, giving you only two options: reboot or debug. To debug, you need to remotely access the crashed system by Telnet, a feature that Apple turns off by default. In most cases, it's time to reboot.

Apple took advantage of many of the kernel's features, including BSD's built-in resource limits, to make the system stable. Resource limits prevent processes from spawning new processes beyond a preset limit. This prevents an application with an attitude problem from overwhelming your computer's resources and eventually crashing. And, of course, the modern memory manager keeps each process running in its own memory space, preventing one application from stepping on another.

Not everything is rosy in terms of stability, though. Although we have only had one kernel panic, we've seen our fair share of applications crashing, including the Finder. When applications die under OS X, they only affect themselves, leaving the rest of your system up and running. While it's nice to know that when your browser crashes, your word processor document is still there in fine shape, crashes of any type are still annoying. If you have multiple Classic applications open and one dies, it generally takes everything with it. The Classic shell is considered a single process, regardless of how many applications are running in it. Crash a Classic application, and most likely the Classic process will die, too.

Still, the stability of OS X is well above par, especially if you compare it to OS 9.x. Most stability issues come from running older apps or the many beta versions of new applications and device drivers available for OS X. As

## What's New In 10.1

new native applications and drivers are released, stability will only get better.

**Performance.** 10.0.4 offers performance improvements, but they're not dramatic. For that, you'll want to go straight for the 10.1 upgrade. Check it out in the "What's New In 10.1" sidebar.

### Boot Up Time

We measured cold boot time for both 9.2.1 (1:10; minutes:seconds) and OS X (1:24) from the moment we pushed the Power On button until the desktop was drawn and available for use. The time it takes to run POST operations is included, so boot time is greatly affected by the amount of RAM and other hardware components that are run through a self-test.

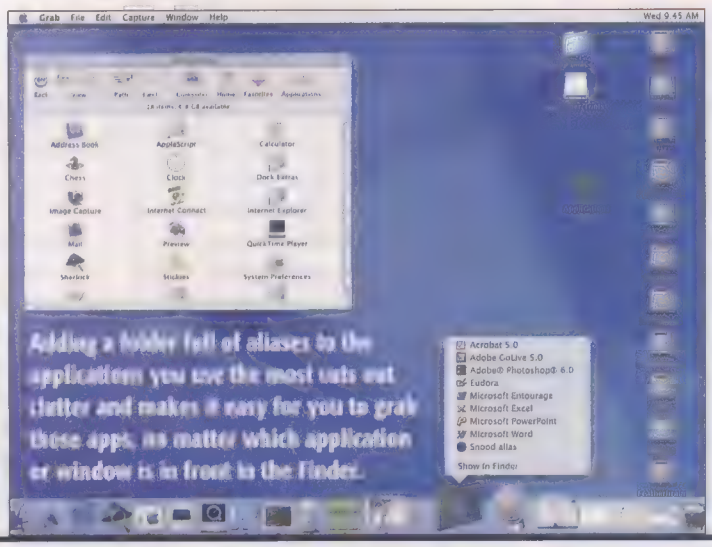
While these times are reasonable for a cold boot, OS X should boot quite a bit faster as the code becomes better optimized in future releases. For now, Apple decided that a simple linear boot sequence is the easiest and safest way to get the computer booted. In the future, OS X could use a parallel boot process, starting up multiple tasks at the same time and greatly reducing boot time.

### Application Performance

Most applications run at acceptable speeds, regardless of whether they're running in the Classic or native environment. Classic applications seemed to suffer little, if at all, when we ran them under OS X, which is understandable because Classic applications don't actually run in an emulation layer, although you will hear that term used quite often. Classic applications are PowerPC native applications, the same as Carbon or Cocoa. In this case, emulation refers to the spawning of an OS 9.x environment for the Classic programs to run under.

We did see a performance hit in the launch time of applications. Both the native and the Classic environments have a lot of overhead involved in starting an application. Once launched, both native OS X and Classic applications run at the performance levels you've come to expect.

### The Finder




Overall, we found the OS X apps to be quick and trouble-free, but we can't say the same of the Finder. Its performance is usable at best; more often than not, it's a major nuisance, particularly window resizing.

In the pre-OS X Finder, resized windows turned into outlines that showed the bounding box of the window you were manipulating. When you finished resizing, the window redrew to the new size. This method was

## OS X vs. Linux

OS X and Linux are both based on an open-source Unix kernel. After that, they go their separate ways. Linux takes a monolithic approach, cramming everything it can into the kernel. OS X uses the Mach microkernel and prefers to have many components running outside the kernel in user space. Each approach has its merits.

The big difference for most users is the GUI. Linux has none, although many distributions include an add-on user interface. OS X includes the Aqua user interface as a highly integrated component. This approach will likely mean that OS X will accomplish something that Linux has been trying to do for years: put Unix on the desktop for the average user, without requiring any knowledge of how Unix works. You won't see OS X advertised as including free telephone installation support, because frankly, you won't need any support to install this OS on supported hardware.

OS X may become the leader on the desktop market, but Linux can't be beat in the server market. Its abilities to run on a wide range of processors and put together a server hardware package at a lower cost are unmatchable. ▲

quick and efficient, but OS X messed that up by attempting to keep such operations live at all times. The window is dynamically resized; graphics and text within the window are continuously redrawn so you can always see all window contents. This results in jerkiness or severe hesitation, depending on system load as the window is resized. Faster hardware helps, but not a lot.

The problem may be in Quartz or the video drivers. Some users speculate that Quartz doesn't currently take advantage of any 2-D acceleration present in the video card, which means the processor is stuck doing all of the move calculations instead of handing it off to the video card. Whatever the cause, Apple can fix it with future releases, either by improving video card drivers or optimizing the Quartz layer.

### The Dock

The Dock is OK for quick access to applications and files, but it's always in the way. You can hide the Dock much as you can hide the Windows Taskbar, but like the X10 ad that pops under your browser with every other site you visit, the hidden Dock can be equally annoying. As you'll see in the "What's New In 10.1" sidebar, Apple hastily fixed this grievance.

### Multitasking

Because Apple designed OS X as a modern OS, we wanted to see how well multitasking and memory management would perform. Both of these functions were an Achilles heel in OS 9.x, but in most cases, the new pre-emptive multitasking works well, proving very responsive to user manipulation across multiple tasks.

The only exceptions are Classic applications. OS X treats the whole Classic environment as a single process; it's up to OS 9.x to divvy up processor time between the apps running under it. The Classic environment only gets a slice of available processor time, and OS 9.x further divides this slice between any apps running in it. If you have multiple apps running under Classic, you can soon find each app starving for processor time. You could use OS X's terminal window to allocate more processor time to the Classic environment, but it's easier to keep the number of apps running at one time under Classic to a minimum.

### Virtual Memory

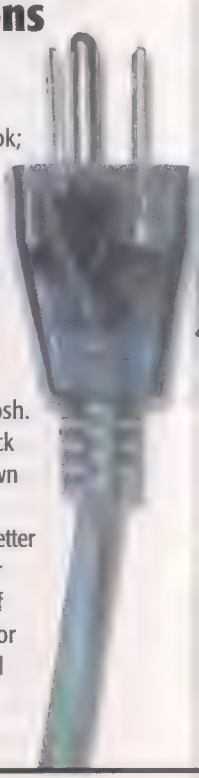
The OS X's virtual memory is vastly improved over earlier Mac OSes. It's always on, as it should be in any Unix-based system. Our only complaint is minor: The swap file is on the same disk as the OS. We'd rather have the option during installation to select a disk partition as the target for the swap file. You can change the swap file location after installation by using the terminal windows and an editor to change a few lines in various /etc files. If you're not familiar with the Unix underpinnings of the OS, this may be an interesting place to start.

### The Bottom Line

OS X 10.0.4 is fundamentally sound, exhibiting stability well beyond what you could get from earlier Mac OSes. We'd like to see more optimization of the Aqua and Quartz levels before we can consider OS X a full-time replacement for OS 9.x, but OS X is the future of the Mac OS. And from what we've gathered about OS X 10.1, it will finally be fast enough, with enough user interface enhancements, to become the OS you'll want on your desk. CPU

**by Tom Nelson and Mary O'Connor**

## Hardware Recommendations



**Apple's Requirements:**

- Power Mac G3, G4, G4 Cube; iMac; PowerBook G3, G4; iBook; Original PowerBook G3 and systems with processor upgrade cards not supported
- 128MB physical RAM
- 1.5GB free hard drive space

**Computer Power User Recommends:**

- Any G4 or later based Macintosh. (You can use G3s, but their lack of the Altvec engine slows down the Aqua interface.)
- 256MB physical RAM; more is better
- 4GB hard drive or partition for installation with a minimum of 1.5GB free space. This is just for the OS installation; you'll need additional storage for your applications and data.

by Dave Tainer

# Office XP Professional

As The Who's Roger Daltrey sang in "Won't Get Fooled Again:" "Meet the new boss, same as the old boss . . ." Microsoft Office XP Professional will have you singing the same tune; there is virtually nothing new here. As I pick up my copy of Office XP and play, it truly is just like yesterday before I upgraded from Office 97 and Office 2000. With the exception of such features as smart tags and speech recognition, the way you have always worked in Office remains the same.

Is this good or bad? You certainly won't have to go buy another "Office For Dummies" book because the one decomposing on your bookshelf will still mostly apply. There is no real need to upgrade, but do buy Office XP if you don't already own an office suite application of some kind.


**Office XP Professional**
Full version: $579; upgrade: $329
Microsoft
www.microsoft.com

## Tweaked But Not Overhauled

In contrast to the upcoming Windows XP OS, Microsoft did not make many changes in actual functionality of its Office XP Suite. Most of the changes are of the cosmetic variety: The menu bars and work area all have a 3-D, technogray appearance. When menu options drop down, they do so Sam Peckinpah-elegiacally; all the more to savor the high-tech appearance of this new Microsoft offering.

For those power users who need to start working right away, you can close the new Task Pane that pops up when you open an Office program, and go to work like you always did. For those computer and software application newbies, the Task Pane helps you find functions that previously required use of the users manual.

Microsoft has also included many "gee whiz, Batman" features, such as speech recognition, handwriting recognition, speech commands, and an online media gallery for photos and images. Using most of these features requires a loaded computer with a fast processor and lots of RAM. Most Office users will probably access these features about as often as they used Clippy, the annoying cyber paper clip that debuted in Office 97 (which taught many how to use the Options menu item).

## Up & Running Before You Finish Your Tall Latte

Installing Office XP is a snap. Even though there are two CDs, only the first is necessary for installation, which on a P4 took approximately two minutes to complete, and on a 300MHz PII took about five. All options are easily accessible and Microsoft holds your hand through the installation, unless you choose to walk by yourself. For Office XP, Microsoft implements Product Activation, which is the final step and must be done over an Internet connection, otherwise the program goes into reduced functionality mode after 50 uses. This means you can view, but not edit or create, documents until activated. This represents the company's latest technique in preventing software piracy and increasing user annoyance.

## Mr. Gates: We Are Not Word-y!

Microsoft Word 2002 is still the best Word processor to accomplish your everyday writing chores. If you want a feature-packed program to write letters, office reports, and even books, Word 2002 will do that and more. In short, if you want a translator, a dictating machine, or an application that takes the scrawls from your notepad and enters them into your PC, Office XP should not be your first choice. For VFM (Value For Money), you also get a pretty decent speech-recognition program (*if* your hardware is sufficient).

More thought out in the new version of Word is Internet functionality. The online Design Gallery for clip art and the online document collaboration utility have been massively improved. Though these are not new, they have been revamped and given more functions. Using these features previously meant onerous menus and above average user-capabilities. With the newest version, there are few who could not use these items now. Tracking document changes is a simple procedure that both Pointy-Hairs and Dilberts in cubicles around the country will appreciate.

So, what's good, what's bad, and what's the same in Office XP? Mail Merge, Design Gallery, Template Wizards, and navigation through features is markedly better from previous Office versions. The office computer geek no longer needs to hover over everyone wanting to perform a mail merge, which will no doubt make him much happier due to more Quake Deathmatch time. Some features from previous versions, though, have undergone no apparent changes. AutoSummarize is a

## Smart Tags: How Do They Affect Your Work?

Smart tags are simply task-oriented tools that help you take advantage of hyperlinking and the Internet. In their default form, smart tags pop up when a user places his mouse over a name, business, or stock symbol, offering the option to get more information or apply some type of action. Smart tags can become powerful tools in any document, but it remains to be seen if users will incorporate them.

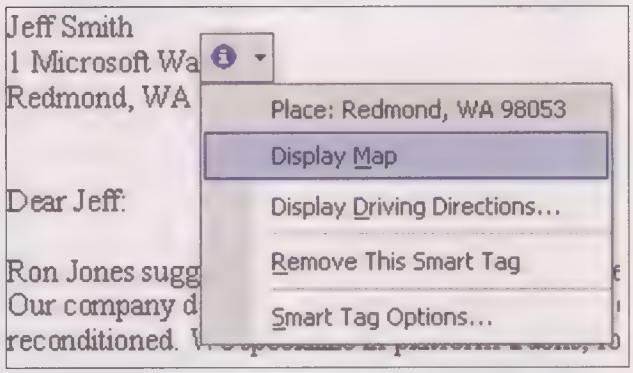
CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

waste of menu bar space; it is likely that monkeys rearranging the words in a 1,000-word document will produce a better executive summary.

What about the new features? Speech recognition is surprisingly robust if you have excellent hardware. In simple sentence structures, Office XP managed higher recognition rates than advertised and actually learned from mistakes. Warning: This useful tool really works; do not be surprised when speech recognition accuracy approaches 98%. Overall the speech recognition feature performs superbly, but its control panel could use some usability enhancements. (See "Training Session" below for a speech recognition sample used in Word XP.)

Unfortunately, the same cannot be said for the handwriting recognition feature. This feature has been a Holy Grail for input freaks, but it is difficult to implement well, and its inclusion into this version of Office smacks of feature-bloat for PR's sake only. Why would Microsoft set itself up for such a miserable failure, if not to just be able to say that it's got handwriting recognition in its office productivity software? Redmond might as well have included nascent AI to write your letters (see the aforementioned monkeys).

As for translation (yes, Microsoft and its partners claim they can translate documents into other languages), don't use it unless you plan to insult a foreign power with your total lack of knowledge using its native tongue. The translation feature demonstrates more of the Microsoft commitment to using the Internet. When you install this feature, it takes you to a partner Web site that actually performs the translation online before dumping it into your Word document.




This is an example of a smart tag with the address feature. When the mouse hovers over the address, a Smart Tag Actions button appears. Click this button, and a menu of actions appears, which lets you choose to display a map or driving directions for the address, modify your smart tag options, or remove the smart tag.

## Training Session

This is a speech recognition sample after the first training session (claimed recognition rate 85%):

"The rain in Spain lies mainly on the plain; whereas the man on the moon only comes out in June." (*NOTE: Semicolon and period were spoken; distance to microphone: three feet.*)

Recognized by Word XP (95%):

The rain in Spain lies mainly on the plane; whereas the man on the moon only comes out in June.

### Excel-lent Number Crunching, Smithers

Excel 2002 also remains the leader in easy-to-use spreadsheets with loaded computing power. And, you can use the new speech and handwriting recognition features here, as well. Probably the best new feature of Excel is the AutoRecover function. Previously, of all the programs in Office, only Word offered protection from the GPF. In XP, Excel and PowerPoint benefit from this technology now, as well. AutoRecover prevents users from losing too much data after experiencing the dreaded BSOD (Blue Screen of Death).

Other than the mostly cosmetic changes to the interface, the Excel 2002 experience is not very different from earlier versions. The main design change is merely to make access to certain features easier, and the Task Pane (in all XP programs) goes a long way in this regard.

### Same Powerful Features

PowerPoint 2002 similarly increases user access to program features, but it does not make changes that will cause anyone to run to his local computer store. Users design their slides, select their transitions, and take their notebooks to the nearest projector to enjoy the show, just like they always did. Marketing departments will sadly shelve their annual plans of disposing their ad agencies—at least until the next version of Office.

Access 2002 appears to be the same solid Windows database platform that it has been for the past few years. Its file format is compatible with Access 2000, and as with that version, is not compatible with Access 97. Conversion, though, of Access 97 files was flawless, with macros, forms, reports, AccessBasic programs, and queries all functioning according to the 97 specs. There are no new features beyond the obvious Task Pane apparent after several uses.

### The Takeaway

If you don't already own an Office software application suite, and you have $500 to spend, buy Office XP. Its features are truly tremendous. If you already own an earlier version of Office (either 97 or 2000), save the money, because you have all the functionality you need whether you are a newbie or a power user. The new features in XP will not greatly enhance your productivity (unless you're a new PC user), and you should only get it if you value the few new features that are currently only available from third-party developers. This is not a must-have upgrade, even though Microsoft Office is a must-have software application for any business. CPU

by David Braue

# CDRWin 3.8F

**CDRWin 3.8F**
$39 (for single user registration; $29 for students)
Golden Hawk Technology
www.goldenhawk.com
(877) 423-7946

Popular among purists even when it was still a group of command-line DOS utilities, Golden Hawk Technology's CDRWin is essential when you need the highest possible degree of control over your finished product. It works around the concept of cue sheets, which are simple text files that describe, to the specific frame, exactly what the recorder should write. Examples will teach you to write cue sheets within a few minutes; in some cases, CDRWin can even do it for you.

Although this approach may sound a bit clunky at first, it gives you highly granular control over the disc's contents. You can add CD-Text titles to individual tracks, create mixed-mode discs with ease, set the length of the gaps between tracks, and more.

CDRWin supports the usual assortment of CD formats and offers excellent data archiving capabilities, including automatic support for Zip files spanning multiple CDs, and the ability to build and manipulate ISO9660 image files. There's also a CD copier, CD-Text editor, and sector editor for viewing raw data directly off of a CD.

While it takes a little more work to learn than typical OEMed burning apps, CDRWin's extra features make it indispensable.Download a 30-day demo version, limited to 1X burning, from www.goldenhawk.com.

# CloneCD 3.0.8.2


**CloneCD 3.0.8.2**
$37.64 ($32.12 to upgrade demo version)
Elaborate Bytes
www.elby.de

Dolly the sheep has nothing on this CD copier for purists, which with a little tweaking, should copy just about any CD you run across.

CloneCD 3.0.8.2, from Elaborate Bytes, features a simple four-button interface controlling its three main functions: copying a CD to a hard drive image and writing from an image, copying directly from a CD- or DVD-ROM drive to a CD-R or CD-RW, or erasing a CD-RW disc. You can also make new icons.

While it may look simple, CloneCD has enough smarts under its hood to let you back up even the most stubborn games and other protected software. This comes from its ability to read and write 94- and 96-byte P-W subchannel data, letting CloneCD copy extra information, such as CD-Text, digital signatures, ISRC, CD+G, gaps, indexes, and abnormal tables of contents that would be lost by more superficial copiers.

Irregular tables of contents are often used as part of copy protection schemes, which confuse normal track-based CD writing programs. By copying this information verbatim, CloneCD can produce functionally identical backup copies of many CDs that would evade the best efforts of Nero, Easy CD Creator, or other burning tools. Download a free demo, which lets you write five CDs, from www.elby.org/CloneCD/english/index.htm.

# Nero Burning ROM 5.5.4.0


**Nero Burning ROM 5.5.4.0**
$69 ($49 for continued use of demo version)
Ahead Software
www.ahead.de

Roxio's Easy CD Creator may have become the de facto CD burning standard through ubiquitous OEM deals, but its tendency to wreak havoc on Windows 2000 and other systems can make it a pain. If you've been struggling with it, consider defecting to Ahead Software's Nero Burning ROM, a strong contender that emphasizes function over form.

Nero supports all the usual suspects: audio and mixed-mode CDs, multisession discs, ISO images, on-the-fly MP3 conversion, MPEG-1 Video CDs, MPEG-2 Super Video CDs, CD EXTRA, bootable CDs, and more. CD copying is handled through the same interface.

The newly released version 5.5.4.0 includes support for various DVD-R formats for mass storage. You can add files by dragging and dropping them between a file browser and the layout pane. CD UDF (Universal Data Format) is supported for packet-based writing onto CD-RW, and the latest versions support newer coaster-proof CD-R drives.

Nero works, and it works extremely well, which is a blessing after struggling with Easy CD Creator 5 and DirectCD. Give it a look if you've had trouble with Easy CD Creator, or if you want a better value for your money without Roxio's unnecessary frills. Download a free demo from www.nero.com/en/download.htm.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

by Jennifer Farwell

# Internet Explorer 6

**IE6**
Free download
Microsoft
(800) 426-9400
(425) 882-8080
www.microsoft.com

If you've been hoping Internet Explorer 6 (www.microsoft.com/windows/ie/default.asp) would blast a path through cyberspace and provide you with a radical new browsing experience, prepare to be disappointed. IE6 has the jazzy new look and feel of Windows XP (which it bundles with), and it incorporates built-in support for Java and a few new tools, but a trailblazer it is not. Of course, mega-rich technology conglomerates aren't known for trailblazing, and Microsoft is no exception. IE6's enhancements fall into two categories: browsing privacy and media file handling. Of these, its privacy features are by far the most compelling.

## Cookie Munching

Ever wish you had a little more power over those commerce-driven Web sites that invade your hard drive with information-stealing cookies at every turn? With IE6, you do.

The browser preferences option has been tweaked to slightly surpass those of its competitor, Netscape 6. Go to the Tools menu, select Internet Options, and click the Privacy tab. From here, you can choose whether to accept or reject all cookies, cookies from either first-party or third-party servers, and/or cookies from sites without a compact privacy policy.

You can also override the preferences to enable or disable specific Web sites from setting cookies. This will appeal to high-volume surfers. You can accept cookies with sites you trust or for which you want login information retained, yet block others from doing their dirty work.

While IE6 is scarfing those cookies, you can also find out which sites are lobbing them at you. View IE6's Privacy Report, found in the View menu, for a list of cookie makers. Or for users with the higher-security settings, look for the privacy icon that appears whenever a Web site attempts to serve up any invasive treats.

IE6 also supports the P3P (Platform for Privacy Preferences), a set of privacy standards that has been under development by the W3C since May 2000. This platform, which was recently elevated to the status of "Proposed Recommendation," provides Web site developers with universal guidelines for publishing privacy policies in a format that P3P-enabled browsers, such as IE6, can read. It also details a higher level of secure information and financial transfer standards than ever before and provides encryption and ID technologies to help ensure the sanctity of any information you release.

## Media Mastery

Whether your flavor of the month is multimedia or graphics files, IE6 offers something to help you get a handle on them.

**Media Bar.** This addition to the Explorer Bar links you directly to the WindowsMedia.com Web site. With frequently updated links to movie promos, music videos, and Internet radio stations, you can jam to Windows Media's streaming audio and video feed, or use the media search tool to find your own.

The Media Bar works very well for audio feed, but the video screen is miniscule. The first time you run video feed, IE offers you the option to view it in a larger window. Do yourself a favor and choose Yes. If you don't choose Yes now, you can always change the setting later by clicking Media Options at the bottom of the Media screen and choosing Settings.

**Image Toolbar.** I found this idiot-proof helper to be more of an annoyance than a benefit, but you may appreciate its convenience. Any time you run your pointer over a graphic, a toolbar appears in the top-left corner. On the toolbar are buttons that let you save, print, or e-mail the image, or view all the images currently saved in the My Pictures folder in My Documents. Unnecessary intrusion? Yeah. But it saves time if you collect a lot of images from the Internet.

**Taming tools.** Two of IE6's features make short work of problems users previously encountered. First, large graphics are now scaled to fit the window so you don't have to scroll around to view them. Second, the Print Preview menu, introduced in IE5.5, sports a drop-down menu that lets you choose which portions of the Web site (Web page, all frames, or one frame) to print.

Do these features add up to a must-have download? Not really. If you upgrade to WinXP, you'll get IE6 anyway. But in a world where every software release promises a brave new world and few deliver anything close, these enhancements make IE6 worth another look.

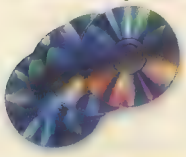
While most attention focuses on two leading browsers, **Internet Explorer** and **Netscape**, Internet.com's BrowserWatch (browserwatch.internet.com) lists more than **50 Windows-compatible browsers**, many of which are free.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

# Accesses Internet radio, MP3s and stored CDs so easily, you won't need help from your kids.

## Introducing the Wave/PC™ system. A revolutionary new product from Bose®.

You don't have to be young to make the most of your PC's musical capabilities. Because now there's the Wave/PC™ system. It doesn't matter if you're 7 or 70, the Wave/PC™ makes it easy for you to go from Web radio to MP3s to stored CDs at the touch of a button.



## Access thousands of Net-streamed radio stations.

You can listen to Web radio stations from around the world with the Wave/PC™ system. Its search feature lets you find the music you want quickly and easily. You can also download MP3 files through the Web and store them on your hard drive for later playback.

## Store and organize your CDs on your PC.

Record your CDs on your hard drive, so all your music is easy to access. Never suffer through those songs on a CD you don't want to listen to again. The Wave/PC™ system lets you select your favorite songs and then file them on your PC. You can even make compilations of your favorite songs from different CDs.

**System Includes:**
Software
Audio Unit
Remote Control

## It's as easy as using the remote.

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## All this, plus Bose quality sound.

To truly enjoy the variety of music you'll have access to, you need to hear it through a great-sounding music system. That's why the Wave/PC™ combines the power of your computer with the high-fidelity sound of acclaimed acoustic waveguide technology. So whether you're listening to Internet radio, MP3s or your stored CDs, you'll hear all your music in rich, room-filling sound.

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# The Bleeding Edge Of Software

## Inside The World Of Betas

Just because a dish isn't quite finished doesn't mean you can't give it a taste before it's done. To that end, here's a look at a few beta programs worth nibbling on while you wait for the main entree.

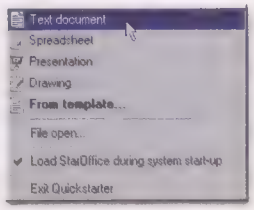
### StarOffice 6.0 Beta

Microsoft has been accused of monopolizing the browser and operating system markets, but the company may just have the office suite market locked up, too. Know of many people who use a suite other than an Office version? Didn't think so. For those brave souls looking to get away from Microsoft suite products, there have always been a few alternatives, such as WordPerfect Office 2000 and StarOffice 5.2. These suites haven't been without some drawbacks, however, such as file-compatibility issues, lack of speed, bizarre user interfaces, and cost.

The latest suite offering from Sun Microsystems (www.sun.com) may just change that. StarOffice 6.0 is now out in public beta for Windows 95 and higher, Linux (most Intel-based distributions), and Sun's own Solaris. Whereas version 5.2 made use of an awkward "desktop within a Windows desktop" GUI filled with mysteriously labeled menus and buttons, 6.0 has a standard GUI that users have come to expect from conventional Windows applications. Combine this with a feature set that most users actually use, Microsoft Office file compatibility, decent speed (even for a beta), and an unbelievable price (free), and StarOffice 6.0 has what it takes to be a runaway hit.

StarOffice features a word processor (which doubles as an HTML editor), a spreadsheet program, a presentation program, and a drawing/painting program. The suite doesn't have a database or contact manager, however. Each application in the suite works within its own program window, and each is always available via a clever Taskbar tray icon dubbed Quickstarter. In addition the Quickstarter makes the universal Opener and Template Chooser readily available.

Each of the apps in 6.0 Beta *feels* like Microsoft Office, but each *looks* very unWindowslike. If you're not a Linux user, StarOffice 6.0 takes some getting used to. The various menu fonts, tool tips, buttons, and floating palettes all use slightly different fonts and spacing than most Windows software. The dialog boxes are filled with plenty of options and commands that are nicely worded, but the spacing and layout is clearly not something from Redmond. The visual elements do, however, duplicate the appearance of the Linux version exactly and are completely functional.




All of StarOffice's core modules are ready for quick launch from the QuickStarter, which takes much less screen space and resources than Microsoft's Office Shortcut Bar.


Iconic menus within the Taskbar are True Launch Bar's claim to fame. With a little preparation, you may never need the Start button again.

In general, StarOffice 6.0 has the features most people will likely want. The word processor, for example, has headers, footers, an outliner, auto bullets and numbers, auto spell checking, footnotes, indexing, and more. The spreadsheet has autosum, equation editing, charts and graphs, database sorting and filtering, and cell styles. The Presentation creator comes with more templates and effects than you can shake a stick at. Most importantly, each application in the suite opens and saves Microsoft Office file formats directly, including fonts, macros, and templates. Even extremely large and slightly corrupted Office files are handled well.

Like most complicated beta software, there are some negatives. First, there must be a great deal of debugging code still present, because each application takes at least two or three times longer to load than the corresponding Microsoft product, despite each being two to five times smaller in size. There are also some file conversion issues, especially when complicated macros or multiple-user revision control elements are involved. OLE only partially works. You can drag and drop a portion of a spreadsheet file into a word processing file, but when you update the spreadsheet, the changes don't carry over. One can assume these chinks in armor are on the glitch list.

The suite's lack of an Outlooklike module may be the biggest problem. For e-mail duties, Outlook Express, Eudora Light, or Netscape Messenger may be sufficient for some people. Even Palm desktop software may be enough to handle organizer needs, but if you need both features combined, there's no real alternative.

Despite this, StarOffice 6.0 Beta is a must-have upgrade for anyone using the current version, even though the current version is final and 6.0 is beta. However, the improvements really are that substantial. For those unwilling to cough up $400 or more for a full-featured Microsoft-compatible office suite, StarOffice 6.0 is highly recommended

and is definitely well worth the 100MB download.

### True Launch Bar 1.1.0.11 Beta

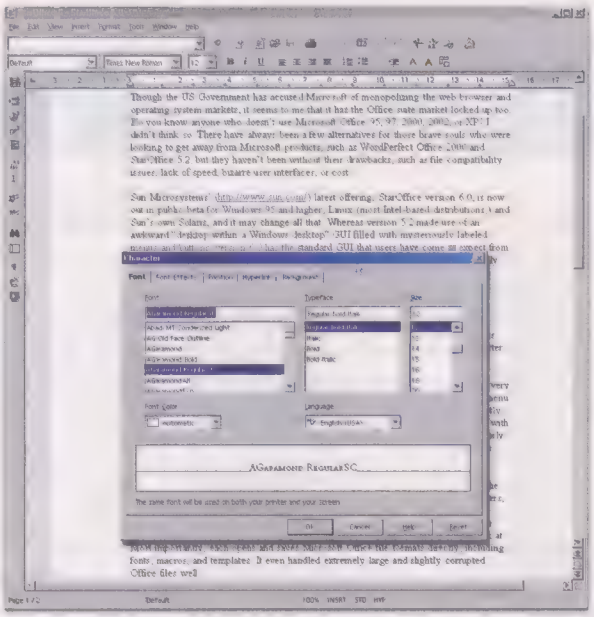
There never seems to be enough space on the Taskbar for all the icons you want available in the Quick Launch area. Evidently, this annoyed the folks at TrueSoft (truesoft .20m.com) enough to create True Launch Bar. If you prefer a clean Windows Desktop and hate diving into the Start menu for absolutely everything, this $10 shareware product is worth installing. New features in the beta may make it indispensable.

Like the Quick Launch area, True Launch Bar adds icons to the Taskbar. Unlike Quick Launch, you can organize icons into groups, such as Internet programs, Web page writing programs, and more. Menus and icons can even respond to hover events, such as starting a program by placing the mouse cursor on an icon without clicking it.

The alternative shell crowd will love that True Launch Bar is fully skinnable. Bundled skins include WinXP and Mac look-alikes. More skins are on the way, as is a skin development kit. The beta also supports plug-ins. One plug-in checks your e-mail server for new messages at preset intervals, and another quickly shuts down your system. Like the skins, more plug-ins are on the way. Also new are virtual folders, which duplicate existing Windows folders on the Taskbar, such as a folder for the Control Panel, the Printers folder, or the Dial-Up Networking screen.

Getting started with True Launch Bar is simple. Unlike some other launchers, True Launch Bar automatically reads and copies the icons you already have in your Quick Launch area. You can add new icons or menus by choosing them with a conventional Open dialog box or with handy drag and click actions using right- or left-clicks.

The beta version we used was quite stable, though the shareware nag screens appear frequently for a version that isn't supposed to be registered.



The word processor application in StarOffice 6.0 Beta feels a lot like Microsoft Word, though some visual elements definitely look a bit alien.

### Personal Passworder 1.2

The big problem with passwords is that you have to remember them. If you're a good surfer and use different combinations of letters and numbers for all the sites and programs that need passwords, you have the different problem of keeping track of them all safely. You probably know that putting your passwords in a text file or on a sheet of paper is a bad idea, but most alternatives are cumbersome.

Personal Passworder attempts to make keeping a password "locker" as painless as possible, and it succeeds in most respects. Entries are kept in a file that's protected by a 400-plus-bit Blowfish-encrypted file, which should resist all determined cracking attempts. Password entries are searchable, sortable, and capable of being filtered; dealing with hundreds at a time is easy. Additionally, Copy or Paste buttons seem available next to every field, so adding URLs, logins, passwords, or notes doesn't have to involve a lot of detailed typing. (There is also a clipboard wiping command that will safely remove all this information from the clipboard when you're done.)


Personal Passworder reduces the major headache of safely keeping track of hundreds of passwords and registration codes to just a tiny inconvenience.

Lots of small touches add up to a program that is well thought out. Personal Passworder can automatically minimize and reset its own password after a certain amount of inactivity, ensuring security if you walk away from your PC. It also has a slim toolbar mode, so you only need to dedicate a tiny bit of screen real estate when you have many browser windows open. Built-in import and export functions make moving passwords between different computers a cinch, too. There are even tools for generating truly random passwords on the fly and creating programmable hotkeys and support for multiple users. For the true belt-and-suspenders crowd, Personal Passworder can also print every entry it contains. (Better leave that printout in the safe.)

The current beta version is a little shaky in the stability department, but the features are rock solid, so the future looks good. There seems to be a long version list, so it's a safe bet that bugs are fixed quickly. Check the beta out at DVASoft's Web site at dvasoft.mastak.com. CPU

**by Warren Ernst**

by Chris Pirillo

# Beats The Heck Out Of Me

*Chris Pirillo is the founder of Lockergnome.com (www.lockergnome.com), which distributes free technology-related newsletters daily. Chris also hosts "Call for Help" on TechTV (www.techtv.com) and answers tech questions on his syndicated weekly radio show.*

Windows XP. Love it or hate it, your friends and family will soon be using it. And ya know what? Contrary to popular belief, that's a good thing. Most people don't care how their computer works, as long as it works. They want to create greeting cards, play Solitaire, and send an e-mail or two at the end of the day. Joe and Judy Consumer don't care about clock cycles. My mom doesn't sit in front of her screen to maximize performance; she completes tasks. And XP, despite its shortcomings, has everything she needs.

Microsoft is constantly raked across the coals for bundling applications with its OSes. Some in our industry hate it, even though people like my parents love it. Why? Because they honestly don't care!

**Microsoft is constantly raked across the coals for bundling applications with its OSes.**

In many respects, I harbor similar feelings toward my car. When I sit behind the wheel, I don't care what kind of engine is under the hood. I want to know if it can get me from point A to point B safely. If I can listen to a Moxy Fruvous CD en route, I'm all the more satisfied. After purchasing this vehicle, I immediately upgraded its factory-installed radio, speakers, tires, and floor mats. The basics did the job, but I wanted more.

WordPad does the job, but it's no Word. Paint works well, but it's not Photoshop. Windows Media Player sings, though it can't handle RealAudio or QuickTime formats. Do you see what I'm getting at? Complain all you want about Microsoft bundling applications. I'd wager to say that your non-geeky associates couldn't care less. They want to "do stuff" with their computer. They want to get into digital video editing without paying an arm and a leg. They want a complete out-of-the-box experience.

They're going to get XP. Will they love it? Beats the heck out of Me (WinMe, that is). Built on the very stable NT kernel, XP will revolutionize Joe and Judy's computing experience. Pundits are up in arms about Windows Product Activation. But, as evidenced through recent Microsoft policy changes, those who purchase OEM computers probably won't have to bother with it. In three years, they'll purchase a new system (possibly from the same OEM). These are the people I deal with daily.

But I also deal with people like myself. We wanna tweak system settings, own the fastest hard drive, maximize our video frame rates in games, and control every move our computer makes. We got used to installing the same Windows copy on countless machines. After all, we own the OS. Or do we? Take a hard look at Microsoft's Windows End-User License Agreement and tell me what you find.

When was the last time you heard grandma complain that she couldn't rip MP3s from her legitimately purchased copy of Herb Alpert & The Tijuana Brass "Greatest Hits" CD? My point? She doesn't care. The world is filled with people just like her. XP is mostly for them. If you find Microsoft's anti-piracy tactics too bold, stick with an older Windows version. Or, leap to a different OS or platform. But ya know what? As Seven of Nine says, "Resistance is futile."

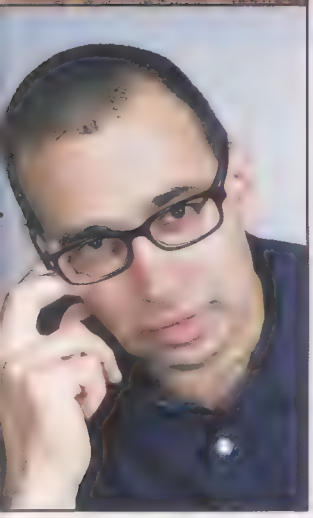
When we purchase a vehicle, we expect to buy gas every few weeks. When we install cable or satellite television service, we expect to pay a monthly fee. We're used to jumping through these hoops to go where we want and see what we want. The OS as we know it will be fundamentally different in a few years. I'm not saying we should throw up our arms and accept the inevitable, but cutting off your nose to spite your face is never advisable.

If you don't want to upgrade to XP, don't. It's your prerogative. I'll encourage my parents to make the move; I've seen enough to know it's just as good, and in many ways better, as Win2000. I'll probably upgrade to it, too. More people will use the XP consumer installation soon enough. If I don't master its intricacies, I'll fall behind. If it helps cut down on those 1-in-the-morning "my computer keeps crashing" calls, I'm all for it. ■

*You can reach Chris at chris@cpumag.com.*

by Pete Loshin

# Show Me The Money:
## Free vs. Non-Free



*Pete Loshin, former technical editor of software reviews for* BYTE *magazine (print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.*

Wanna save hundreds or even thousands of dollars on software licenses, per user? Ditch Microsoft and go open source. Wanna keep your job? Make sure you're right before doing anything. Open source doesn't guarantee savings, but it does make them possible.

Top-of-the-line, non-upgrade versions of Windows XP and Office XP will set you back about a thousand clams combined; upgrades may cut that in half. Conversely, you can download a Linux distribution, plus all the applications you want, and install them on every system in your office for nothing.

When I ditched Microsoft last year, it wasn't about the money. (Let's just say that my systems attract bugs like cubicle walls attract "Dilbert" cartoons.) With no plans to upgrade my Windows or Office licenses, I still saved serious moolah.

**With no plans to upgrade my Windows or Office licenses, I still saved serious moolah.**

How? Time, which equals money, after all. For me, Windows was a big hole that I threw time into. All I wanted was to run Word, Netscape, and Eudora. I endured slow system boots, slow software startups, overloaded software that crashed daily, and annual ground-up reinstallation sessions.

Today's Linux distributions install faster and easier than any Windows version I've used, starting with Windows 2.0 up through Win98. Maybe Win2K or WinXP are easier, but I'll probably never know. Linux configuration and software installation are faster and easier than Windows, with no rebooting for changes to "take effect." For my money, Linux boots, shuts down, and runs faster than Windows on the same hardware, without the daily crashes.

Second, hardware is money. Linux works fine on a 200MHz Pentium II CPU with 64MB of RAM and a 1GB drive. You get a nice GUI desktop, plenty of applications, and disk space to spare. Windows XP needs a 233MHz CPU or better, 128MB of RAM, and 1.5GB of your disk.

With Linux you needn't replace high-end PCs every two or three years (or whenever the next Windows version arrives). Linux servers last longer, and Linux runs great on notebooks where less power can mean a lot less money.

But really, it's not about money. Linux is fun. Networking with it is easy. Things like all-node automatic LAN backup are trivial to set up. No worries about Microsoft Exchange virii, either. If online Linux forums and Web sites aren't enough, buy commercial support from vendors that have no vested interest in selling you more software. The apps are easy to use but can handle complex tasks; the GUI is endlessly configurable.

Plus, there's tons of great software free to download. There's also a ton of crummy free software. You'll have to figure out which is which. Once you find the software, you'll need to learn to use it, and the more you need it to do, the more time you need to invest.

In theory, security can be an issue, too. Consider examining the code to make sure it does what it's supposed to and not more. You don't have that option with non-free programs. You have to take the vendor's word the product is secure. In practice, though, many open source packages are considered at least as robust, reliable, and secure as commercial alternatives.

What about support? Open source projects offer no warranties, no recourse if programs break or do something bad. Of course, commercial vendors see support as a revenue stream and sell software under licenses guaranteeing little more than the installation media.

Changing to a new OS means recertifying internal support staff, retraining users, reinstalling software, and reconfiguring systems. However, you don't have to upgrade workstations to meet new minimum system requirements. You don't have to upgrade at all if your systems are all stable.

But forget the money. What if you make the wrong choice, or Linux is just a fad? What happens if Microsoft uses .NET to turn the Internet into MSN, or an undetectable and undefeatable Linux virus spreads across the Internet? I don't know, but I'm not worried. I'll risk it for the great free software and the most fun I've had this side of a keyboard. ■

***You can reach Pete at opensauce@cpumag.com.***

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# Wearable Computing

## Put On Your PC

Ahh, vacation. You check your e-mail, make a few phone calls, hit the beach, and relax with some soft music and a good book. You converse with the locals and take pictures and video of your serene surroundings, instantly sending the images to your friends back home. After making dinner reservations, you watch the news, hop into your rental car, hit the restaurant, and enjoy a fabulous meal while eavesdropping on conversations happening all around you. Finally you head back to the hotel, where your room temperature is perfect, and a hot bath and your favorite movie are waiting for you.

What makes this different from any other vacation you've taken? You didn't have to do anything. You accomplished all those things with the help of a simple-looking pair of sunglasses. A pair of sunglasses with a computer powerful enough to translate languages in real-time, senses the needs of your body and mind, and stores all of the information you've ever read and all the conversations you've ever had.

### Today's Hard Wear

That was a glimpse into tomorrow, possibly as little as 10 years down the road. Today's wearable devices are neither as functional nor as unobtrusive, so don't expect to see them strap-ped to some hottie at the Oscars anytime soon. That will soon change, though, as plenty of companies today are gearing up to become players in what many analysts predict will be a multi-trillion dollar wearable computer market.

Considering devices generally become more expensive as they get smaller, it seems impossible that anyone, let alone masses of consumers across the globe, will be able to afford this hardware. However, with all the potential services these products will integrate, there's a good chance companies will sell the hardware at a loss and make up the difference with monthly subscription fees. Wearables of the future are being designed to replace your PDA, desktop computer, cellular phone, wireless Internet device, radio, television, and practically every other electronic device you can think of.

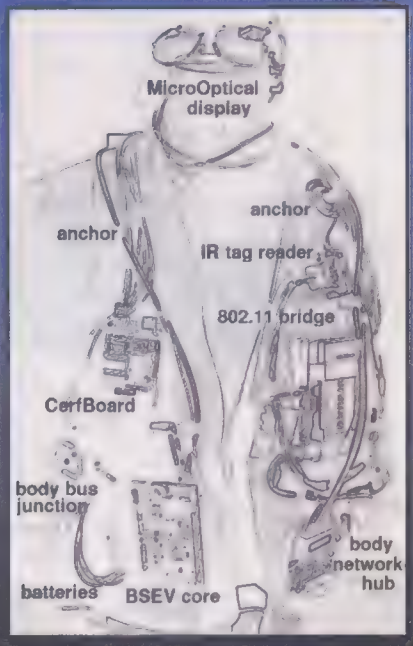
"I see the people that provide those services all adopting this technology and in fact sponsoring it—subsidizing it to the point where we'll be able to compete with the little cell phones that they give away today," says Edward Newman, who is chairman, president, CEO, and founder of Xybernaut (www.xybernaut.com), which has manufactured wearable computers for the working class for years and commands a sizeable share of the overall market.

Xybernaut recently licensed some of its technology to Hitachi, which plans to break into the consumer wearable market around Christmas 2001 with a WIA (Wearable Internet Appliance). This device is equipped with a Hitachi RISC CPU and layers its browser on top of the WinCE 3.0 OS. The head-mounted translucent display depicts a virtual 13-inch monitor with 800 x 600 resolution and weighs less than 2.8 ounces. No word yet on what the WIA will cost.

**Charmed Technology.** In terms of technology and functionality, Hitachi's WIA is limited. Companies, such as Charmed Technology (www.charmed.com), provide a much better overview of where things are headed, as their wearables are designed to do anything a PC can do and to be used all day, every day.

"It bothers me when I see some of these really amazing cute things that come out of major amounts of research money that are just impractical to wear for one reason or another," says Greg Priest-Dorman, a platform design engi-

Richard W. DeVaul, an MIT Wearable Computing Lab Researcher and Toshiba Fellow Ph.D. candidate, poses with the fruits of his team's labors: the MIThril system. The drawing below shows each element of the MIThril more clearly.




The IBM Wearable PC isn't small enough to be invisible, but it does fit nicely in a jacket pocket. Note that the head-mounted display swings up and down so you can see where you're going.

neer at Charmed who also works as a systems administrator for the Computer Science Department at Vassar College in New York. "That's the big difference with Charmed. We were started by and are a company primarily of people who wear all the time. So our stuff works if you're going to put it on and use it all day."

Priest-Dorman should know, as he's been wearing full-time since the mid-1990s and was creating his own equipment a decade before that. Products from Charmed, such as the $6,495 CharmIT Everyday Color Display Bundle and $4,245 CharmIT B/W Display Bundle, reflect this experience and do more than let users browse the Web. Battery life is long, about 11 hours, and current units eschew expensive proprietary batteries in favor of small, easily obtained camcorder batteries. The kits for sale now have PC Card slots, multi-GB hard drives, USB ports, Ethernet ports, and up to 400MHz processors so they can run a variety of desktop operating systems, and nearly any sort of functionality can be added. The company offers both rugged, low-power grayscale displays and more energy-hungry color displays people wear on their heads or strap to their glasses. "It's about 10 times the price of a Palm, but it does everything your desktop does. It's not a compromise machine," says Priest-Dorman.

**By 2007, more than 60% of the U.S. population aged 15 to 50 will carry or wear a wireless computing and communications device at least six hours a day.**
SOURCE: GARTNER

**IBM.** Big Blue (www.ibm.com) plans to jump into the wearable market and has developed a prototype that has much more functionality than the WIA that Hitachi is working on. The entire unit, called IBM Wearable PC, has computing power equivalent to a ThinkPad 560LX, with a 233MHz Intel MMX processor, 64MB of RAM, 2MB of video memory, and a 340MB IBM MicroDrive. There are two PC Card slots and a small 320 x 240 grayscale display. The system runs Win95 or 98. It's tiny, but the 2-hour battery life will limit all-day use. IBM is refining the prototype; shipping units will likely come with a better full-color display and better battery life.

## The Research Goes On

Some of the most exciting developments in wearable technology are happening in university research labs. By the time you read this, Carnegie Mellon University's Spot project (www.wearablegroup.org) should be tested and possibly ready for purchase, although no pricing information was available at press time. The current iteration of Spot incorporates the advances made in 12 preceding generations and packs a lot of processing power in a wearable form factor. It accepts up to 512MB of SDRAM, has two PC Card slots and two IEEE 1394 ports for expandability, and uses the Linux OS. It has 2MB of dedicated video memory for 1,024 x 768 XGA resolution in 32-bit color and uses a host of power monitoring and saving features to extend the battery life. All this in a package only 6 inches high x 3 inches wide x 1 inch deep that weighs a little more than half a pound.

Carnegie Mellon is known for other wearable-related research, including a language translation engine developed by the school's Language Technologies Institute that translates speech in real-time. The technology has the potential to eventually smash all language barriers.

**MIT.** As you'd expect, MIT (www.media.mit.edu/projects/wearables) is one of the major forces driving wearable research. Dr. Steven Mann and Dr. Thad Starner, widely considered the two biggest experts on wearable computer technology, graduated from MIT and laid the foundations for the current MIThril project in development there. MIThril is a pure research project; there are no plans to manufacture and sell the technology. The current version of the hardware is worn as a vest, with display output to a pair of glasses or sunglasses. The research team focuses on making the MIThril hardware context-aware, meaning it senses what is happening around the user and attempts to react accordingly. See the "Are Context-Aware Computers Coming?" sidebar for more info.

Greg Priest-Dorman of Charmed Technology has been using wearables such as this for years. He makes his own equipment, sometimes using off-the-shelf components from Charmed but always heavily modifying them, so these pieces have no names.

The hope is that wearable tech will some day be miniaturized so it can be woven into fabric and worn as normal clothing. Display issues will still be a problem, but the processor, storage unit, and other peripherals will eventually become invisible and so light so as to be unnoticeable.

## Get Used To It

It will take a certain amount of consumer acceptance and training for

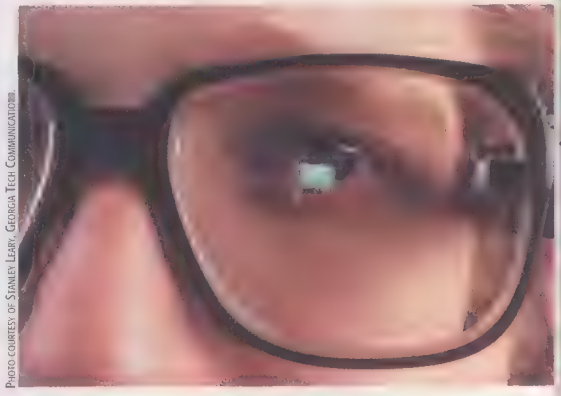


PHOTO COURTESY OF STANLEY LEARY, GEORGIA TECH COMMUNICATIONS

Dr. Thad Starner, an assistant professor at Georgia Tech, wears a pair of prescription MicroOptical computer display glasses. Note the image projected from the temple piece onto the 3-D display in the lens.

This videocam and watch combo is part of Dr. Steven Mann's WearComp system. It potentially could become a user interface controlling a complete suite of wearable peripherals. Note the analog clock overlay.

wearables to become part of our everyday lives, but experts are confident that the transition is inevitable. The way is already somewhat paved, as most people think nothing of lugging a digital camera, portable music player, cell phone, PDA, and other electronic equipment almost everywhere they go. The ability to integrate all those things into a single, portable device will likely come as a welcome option. It's getting used to interacting with the devices that may be tough.

"It's both immediately much more and much less obtrusive," says Priest-Dorman regarding the wearable he relies on daily. "It's kind of always there in my ear, reminding me of appointments, telling me about things, reminding me to say certain things to you right now. But at the same time it's much less there because I don't take it out and look at it. It's not stopping my attention from doing other things."

### Repercussions

As wearable computers become smaller and eventually integrate with our clothing, eyeglasses, and other accoutrements to the point of invisibility, the potential for their abuse increases dramatically. What's to stop someone from using the technology to cheat on tests or at gambling? Indeed, according to the wearable technology timeline maintained by Bradley Rhodes at MIT, a sort of wearable computer was used in 1966 to predict where a roulette ball would fall or a wheel of fortune would stop and relay that information to a bettor.

That was nearly 40 years ago. Ten years from now, athletes could use computerized goggles to augment their peripheral vision or even to perform complex mathematical operations that let them predict the trajectory of balls, "see" the ideal racing line, or break the rules in many other ways. Expect to see legislation regarding the use of wearable devices as we sort out the problems they pose. The benefits of wearable technology outweigh the disadvantages, but we'll have to answer some tough questions as the gap between man and machine narrows. CPU

by Tracy Baker

## Are Context-Aware Computers Coming?

As wearable products become smaller, faster, and more efficient, they may be able to get their power from solar energy or the movements of the people wearing them. The biggest changes, however, will be in the way humans interface with these devices and the devices interface with humans and their environments.

Context awareness is one breakthrough waiting around the corner. Context-aware devices actively or passively gather information about your surroundings and change their behavior based on where you are. These devices might give a loud alert for incoming e-mail if they sense you are on a noisy airplane or a quiet alert if you're in a theater. Similarly, these devices might read information to you if you're driving but let you read the message off a head-mounted display if they perceive you are sitting in your office. Future houses wired to interact with these devices could detect music you've selected with your wearable and pipe it into whatever room you're in.

**BlueEyes.** Plenty of research is being done in this area, including the BlueEyes project at IBM's Almaden research center. BlueEyes researchers are attempting to create computers that not only track your pupils to let you interact with what you are looking at, but also to detect and respond to a user's emotional state. This affective computing technology could be used to tell if you're getting drowsy while driving and do what it can to keep you alert.

**Just say it.** Speech recognition interfaces will also incorporate context sensitivity. If you're using your wearable to browse the Web and say "I want to see CNN," it will take you to the news network's home page. If you say the same thing while browsing television listings, your wearable computer will tune the channel in and adjust the volume or closed captions depending on where you are when the command is given.

**How are you feeling?** Biological feedback also stands to be a big part of future wearables. The devices will know if you are hot or cold, bored or busy, scared or elated and respond based on your current needs. They will track your pulse rate, check blood sugar, and perform other medical tasks that potentially could keep healthy people healthy and help the sick get better. "I think by the end of this decade, we'll have everything short of implants," says Edward Newman, "and you might even start seeing some implants on certain people to correct medical deficiencies that the wearable computers will actually manage and monitor. No different than your pacemakers, hearing aids, people with visual problems and stuff like that that the computer can correct."

As for human interfaces, most experts agree that improved voice recognition combined with other technologies will become the norm. "You'll see speech integrated with technologies like eye tracking and artificial intelligence," says Newman. "It'll also keep track of your preferences for food, for hotels, for movies—maybe even to the point where the dating services will let you know that there's some girl you're really attracted to based on her background and she's over there in the restaurant." ▲

# Fashion For Geeks

## Is That RAM In Your Pocket?

Even though your mom told you to every time, we bet you were one of those kids who always forgot to empty your pockets before tossing your jeans into the laundry pile. And as long as you didn't have a pen in your pocket that ruined the entire load of clothes, it wasn't a big deal. The worst thing that happened was she washed a couple of bucks or that note from your teacher.

These days, though, the stakes are higher. If you're sporting the latest in tech fashion, your clothes do more than just cover your body; they serve as a communication center for your devices, so you'll want to make doubly sure you've emptied your pockets. Having Mom run your Palm or cell phone through the wash might cost you more than a couple of bucks. (But you've probably got bigger issues if your mom still does your laundry.)

### Dockers Mobile Pant

You probably won't wear the new Mobile Pant from Dockers for fashion reasons, but you may find that their convenience is too hard to pass up. For $52, you'll get a pair of khaki pants that sports seven pockets. Even though you may have to draw yourself a diagram to keep track of where you've stored your devices, you should be able to fit them all in somewhere. Each pocket is larger than typical pants pockets, giving you room to carry other items, such as airline tickets. The zippers for each pocket hide behind seams, meaning the Mobile Pant looks a lot like regular Dockers pants. We don't know if that's a good thing or not.

**www.dockers.com**

### What To Wear Tomorrow

The tech clothing industry is off to a good start, but it's still in its infancy. Here's a glimpse of what you can expect in the next several years.

IBM's Almaden Research Center is developing items such as wearable jewelry, which could include a tiny camera in your eyeglasses and a speaker in an earring that could recognize the faces of acquaintances and then give you audio clues as to their names. Bracelets could contain cell phone components; necklaces, cufflinks, or nose rings could contain microphones.

*For more on what you may be wearing tomorrow and tech clothes that can improve your health and productivity, see www.smartcomputing.com/cpumag/dec01/geekfashion.*

### Levi's ICD+

In Europe, Levi's and Philips have collaborated to develop ICD+ jackets that can hold several mobile tech devices from Philips. You can fit the jacket with a microphone in the collar or listen to music through hidden headphones. All of the pockets are wired together so it's no hassle to stop your favorite song to answer a call. No word yet on when these jackets will be available in the United States.

**www.levis-icd.com**

*by Kyle Schurman*
*Graphics & Design by Ginger Riley*

## Reima Smart 3305

Scheduled for a late 2001 release in Europe by the Finnish company Reima, mobile tech users will appreciate the Smart 3305, a body belt that uses wireless technology for group communications. You can store your Nokia (the only brand the Smart 3305 works with for now) mobile phone in the body belt and then communicate with other users in your group by pulling a message tag and speaking into a microphone. The message tag connects to a button on the Smart 3305, which activates the phone's group audio messaging capabilities, meaning you don't have to fumble for the right button. Reima is aiming the Smart 3305 at snowboarders and skiers, but the less coordinated of you can still use it in many business settings. The Smart 3305 should cost 330 Euros (US$304).

**www.reima.com**

## Nike SDM Triax 100

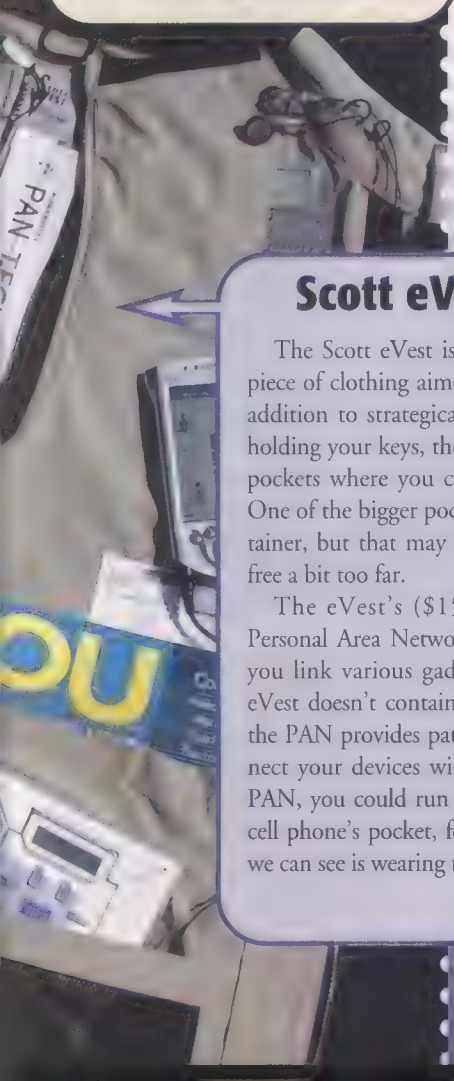
Nike has long been a cutting-edge company, and it's continuing that tradition through development of sports- and workout-related tech gear in Nike's Techlab, the company's high-tech sports gear division. Try the SDM Triax 100 ($199), which hooks to your shoe and measures distance and speed 100 times per second. An accompanying watch receives the measurements via a wireless signal. This tiny accelerometer will provide enough data to make even an accounting geek take notice, including lap split times, maximum and minimum speeds, and total exercise time performed at optimum speed.

**www.nike.com/techlab/indexflash.html**

## Sanyo Fashion House Raincoats

Those of you with a little fashion sense will be glad to know Sanyo Fashion House is offering a series of raincoats featuring special pockets for holding portable tech devices. Sanyo Fashion House, a subsidiary of Sanyo Shokai of Tokyo, has collaborated with Palm to design raincoats with pockets specifically designed for Palm PDAs. Sanyo Fashion House has lined the pockets with a waterproof static shield lining, and the pocket's button even features a Palm logo. These high-quality raincoats (which will cost you anywhere from $185 to $695) offer an additional pocket lined with antimagnetic material for a cell phone. Keeping your devices dry has never looked so good . . . or been so easy.

**www.sanyofashionhouse.com**



## Scott eVest

The Scott eVest is an amazing, highly functional piece of clothing aimed at the hardcore tech user. In addition to strategically placed loops and a clip for holding your keys, the eVest contains a whopping 15 pockets where you can store the devices you need. One of the bigger pockets can even hold a drink container, but that may be taking the notion of hands-free a bit too far.

The eVest's ($159.99) ace in the hole is its Personal Area Network inside the lining, which lets you link various gadgets in different pockets. The eVest doesn't contain any wiring in the vest; rather, the PAN provides paths in the lining for you to connect your devices with their own wiring. With the PAN, you could run a hands-free headset from your cell phone's pocket, for instance. The only drawback we can see is wearing this thing on a 90-degree day.

**www.scottevest.com**

## Techno-bra

Kursty Groves developed the Techno-bra while a design student at the Royal College of Art in London, and PDD in London is now trying to develop and commercialize the idea. The Techno-bra, also called the Intelligent Bra, will measure the heart rate of the wearer with an electrically conductive textile. Upon a sharp change in heart rate, which could signal a serious medical condition or sudden fear induced by an attack, the Techno-bra will send a distress signal via wireless mobile communications. A GPS in the Techno-bra will alert medical personnel to the wearer's location.

Because the bra can tell the difference between the heart's reaction to a sudden fright and the gradual increase the heart rate makes from exercise or other, um, activities, false alarms are less likely. The wearer can disable a distress signal if necessary, though. PDD has yet to set a price for the Techno-bra.

**www.pdd.co.uk**


### PocketColor 200 Print & Share

Face it, most portable photo printers aren't very portable. You need a way to share your digital camera shots with a printer that fits in a pocket, not a backpack. The 10.5-ounce, 5.5-inch x 3.3-inch x 1.4-inch PocketColor 200 from SiPix ($179; www.sipix.com) may be the answer. The printer uses thermal transfer technology to output three-color (CMY), continuous tone pictures at up to 254dpi. The 2- x 2.5-inch images aren't something you'll frame over the mantle, but they're great for sharing with friends and co-workers. The printer connects to a camera via USB and includes 20 sheets of photo paper.

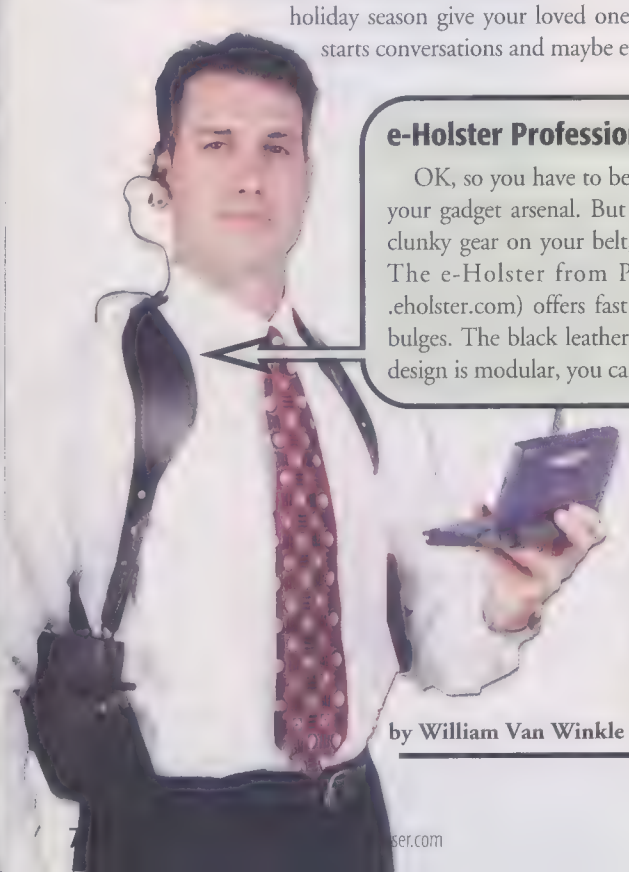
### DiskOnKey 128MB

"Where's your presentation?" your boss demands as you waltz into the sales meeting twirling your keys around your finger. Smiling, you tug a small gizmo from your key chain and plug it into a notebook's USB port. "Right here," you say as your DiskOnKey from M-Systems ($149.95; www.diskonkey.com) immediately registers as a removable drive on the host computer, just like most flash media readers. The 128MB is enough to store vast PowerPoint presentations, images, videos, MP3s, and more. Models start at 8MB ($49.95), with sizes up to 512MB due in 2002. The DiskOnKey works on Windows, Mac, and Linux platforms, and a hard plastic cap keeps the USB connector safe from other dangers lurking in your pocket.

# When Function Meets Funk

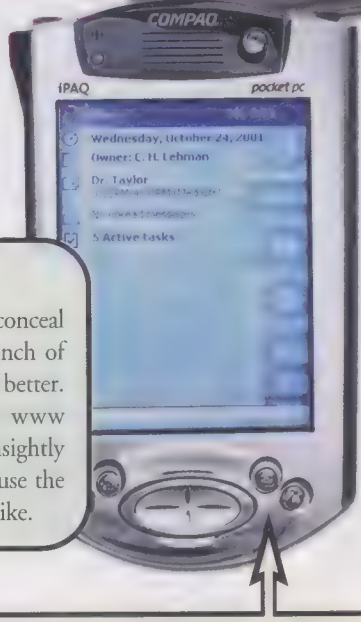
## On-The-Go Goods That Style & Profile

New Economy or Old Economy, nothing says "chic" quite like the right gadget. We don't mean some supercomputing watch the size of a hockey puck or a brick-sized PDA/cell phone that annoys everyone by beeping Mozart at top volume. We mean chic, not geek. This holiday season give your loved one (or yourself) that portable little something that starts conversations and maybe even helps increase productivity.



### e-Holster Professional (Leather)

OK, so you have to be a bit of a geek to wear a revolver-style holster to conceal your gadget arsenal. But hey, you don't want to make a scene with a bunch of clunky gear on your belt, and toting a cute little "man purse" isn't much better. The e-Holster from Personal Electronics Concealment ($89.95; www.eholster.com) offers fast access to your cell phone and PDA without unsightly bulges. The black leather harness is adjustable and comfortable; plus, because the design is modular, you can remove or add as many optional pockets as you like.




### iPAQ H3800

Those who want portable power with style and convenience should look to the Compaq iPAQ (www.compaq.com) line. The new H3800 series ($599 and up) is based on the Pocket PC 2002 platform. If you thought Pocket PC was cool before, hold on. The H3800 (32MB or 64MB configurations) features iPAQ's much-loved reflective TFT screen for easy reading in bright sunlight and built-in or optional Bluetooth networking. A SD slot is standard.

by William Van Winkle

## NOMAD Jukebox (20GB)

Conventional MP3 players give you an hour or two of music you can play over and over before you have to download new tracks or swap flash cards. You can go with a CD player with MP3 compatibility, but you still have to burn CDs. Creative Labs' NOMAD Jukebox ($399; www.nomadworld.com) is the size of a portable CD player, has the USB-based convenience of a standard MP3 player, but blows both player types away with its 20GB storage, enough for up to 340 hours of CD-quality music. The jukebox plays MP3, WAV, and WMA files, and is firmware upgradeable for future formats. You can record from most sources, including DAT and LP. Integrated digital signal processing circuitry lets you overlay Creative's EAX spatial effects onto your songs. You even get four-channel output and not just standard stereo.

## Pocket CoPilot 2002

If you're a Pocket PC user who regularly drives or travels on unfamiliar streets, TravRoute's Pocket CoPilot ($299; www.travroute.com) is an essential survival tool. Available for a Cassiopeia, Jornada, or iPAQ device, Pocket CoPilot uses voice commands to guide you turn by turn. Download updated map data, plug in the GPS receiver, and let the CoPilot guide you. If you miss a turn, CoPilot dynamically replans your route on the fly. The interface is friendly, and points of interest for your destination also download with the maps.

## SunCatcher Expedition

If you're the gadget type, you've fought the battery battle. Most gadgets give you only a few hours before cells drain and leave you hosed. Unless you have a SunCatcher, that is. The SunCatcher Expedition from PowerQwest ($369.95; www.powerqwest.com) is two solar power panels built into a briefcase-sized folder. Point it at the sun and you have up to 25 watts of power for a notebook, portable DVD player, or similar device. The unit weighs less than 5 pounds, stashes away in a carry-on bag, and terminates in a DC cord outlet like a cigarette lighter, so you may need to buy an adapter.

## DM-1 Voice Recorder

Sometimes jotting your thoughts on paper is just too slow, and the hiss of a microcassette recorder is too annoying (not to mention the tape can run out at the worst possible moment). Digital audio has replaced the standard cassette, and it's also putting the microcassette out to pasture. Olympus's DM-1 ($299.99; www.olympusamerica.com) is the company's latest digital voice recorder. A 64MB SmartMedia card can record up to 22 hours of voice footage. You can also record in MP3 and WMA formats. Best of all, the recorder can double as a digital music player when used with the integrated speaker or with headphones on the stereo output jack. Just plug the device in your PC's USB port to transfer hours of music to and from the DM-1.

## REB1200 eBook

The promise of e-book readers is phenomenal. Although today's reality is only a prelude to the future, RCA's REB1200 ($699; www.rca.com) leaves no question that the future is almost here. With a bright dual-scan color display (480 x 640), rechargeable Li-Ion battery, Ethernet connection, and built-in 56Kbps modem, the REB1200 makes it easy to download and enjoy digital text. At just more than 2 pounds, the model is about the size of a hardback and features a protective flip cover. The 8MB of internal memory holds roughly 3,000 pages of colorful magazine content, but the flash memory slot lets you hold much more. If you're on a budget, the smaller, monochrome REB1100 sells for $299.

## Digital Wallet (20GB)

Those 3- and 4-megapixel images you shoot with little or no compression generally leave you with two choices: take only a few high-quality pictures or buy more memory cards. What you need is a pocket-sized gizmo you can dump images to so you can keep shooting. That device is the Digital Wallet from Minds@Work ($549; www.mindsatwork.net). The small hard drive comes complete with its own OS, LCD, PC Card slot, and USB port. The 12-ounce device can store and move any file type regardless of platform, transferring data at 8Mbps to 12Mbps. The Digital Wallet runs up to 120 minutes on its rechargeable NiMH battery and accepts a variety of flash cards with the proper optional adapter.

There's a new voice/data GSM/GPRS Wireless Pack, but your old expansion sleeves will still work. You can put the stylus away and control Pocket Outlook with voice commands and output PowerPoint presentations via an optional VGA-out port. All this comes wrapped up in the sexy compact housing that makes the iPAQ an irresistible conversation piece.

# It's All On The Wrist

## High-Tech Watches Do More Than Tell Time

Not to be too critical of the technological wonders of our time, but we seem to have some catching up to do. 2001 is drawing to a close, so where are those routine trips to the moon and homicidal AI life forms Clarke and Kubrick promised? Granted, few of us are probably too upset artificial beings aren't threatening our existence, but we're still behind the times. At this rate, how much longer will we have to wait for hover cars, jetpacks, in-home moving walkways, and smart-aleck robotic maids?

Science fiction has delivered on a few fronts. Science fiction writers did envision communication satellites and the Internet. But the really cool tech always seems decades away, if it ever comes at all. Skeptical? What about Dick Tracy? This 1930s hard-nosed crime-fighter's coolest tech was a wristwatch/phone. Seven decades later and wristwatch communication is just beginning to become reality.

From a science fiction perspective, we're still behind when it comes to cool technology. Nonetheless, there are some James Bondish toys out there. We still may not be calling friends on our watches, but some users are strapping some pretty cool stuff on their wrists. Today's watches can store personal information, track your position, take pictures, and even change television channels. Some companies are also creating wearable computers only slightly larger than an average watch.

### Get In Touch With Yourself

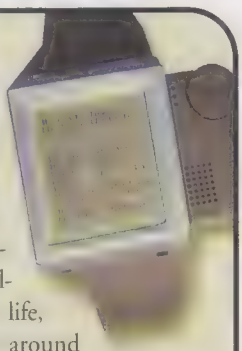
GPS is handy for those of us who can't find our way around a mall parking lot, much less a strange city. When combined with a watch, a GPS system not only helps us find our way, it keeps us on time. Casio's Satellite NAVI ($499.95; www.casio.com) combines a digital watch with a tiny GPS receiver. Provided the watch can communicate with enough satellites, it will pinpoint your position and point you in the right direction.

The Satellite NAVI is a little larger than a typical watch, weighing 3 ounces and measuring 2.3 inches high x 2 inches wide x 0.8 inches deep. The NAVI's size does create limitations, including an inability to provide necessary hardware to use map data to display your approximate position on a map. There are several navigational tools, though, including a plot screen you can zoom in and out on to show your position relative to nearby landmarks that stores as data in the watch. A graphical navigation screen displays a virtual compass with a line pointing you in the direction to your destination.

The NAVI can also interface with a desktop computer. An included desktop application lets you add landmarks and waypoints you can add as preset destinations. You also can import maps to the software to select your waypoints and landmarks. The watch can store 200 landmarks and an additional 400 track points you enter directly. You can upload the track points to your PC and display them on a map. And, because GPS satellites pass times and dates to GPS receivers, the NAVI can set itself every time you get a position fix.

Our biggest concern initially is how battery life will stack up. GPS receivers devour batteries, and there obviously isn't room for a large battery in the watch. To limit the impact on battery life, Casio equips the NAVI with a specially designed low-power GPS receiver, a rechargeable Li-Ion battery, and power-saving design tweaks. While most GPS receivers continually update a position upon receiving a fix, the NAVI's GPS receiver shuts down after the initial fix. You can set the receiver to update its position at regular intervals, or if you have a battery-be-damned attitude, set the watch to continually update. The NAVI's form factor does lend itself more toward the occasional position fix.

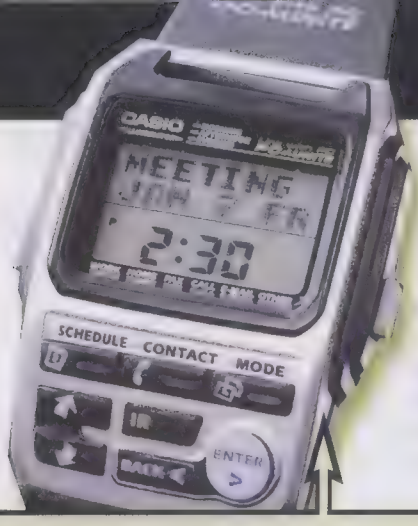
### Wrist Computers



Down the road, wristwatch technology will probably surpass current expectations. IBM has a prototype that runs Linux, but IBM claims the project has more to do with showing the versatility of Linux than with developing a viable product. Battery life, for instance, is rumored to be around two hours, which is far too short for a consumer product, especially a watch. Still, the existence of a Linux wristwatch may be a glimpse into the future of truly wearable computers. Wristwatch designs are not only convenient, but consumers may be more accepting of wearable computers they can strap on their wrists. For more about IBM's Linux wristwatch, check out www.research.ibm.com/WearableComputing/factsheet.html.

### An Angel On Your Wrist

Digital Angel (www.digitalangel.net) is combining several technologies in a product it hopes will help keep loved ones safe and give friends and family peace of mind. The company manufacturers watches and pagers that use miniature sensors to gather biological data, including heart rates and body temperature. Adding wireless and GPS data to the mix lets you know how your loved ones are doing and where they are.




The idea of a spouse monitoring your every move might be, well, a little creepy. But the technology has several not-so-creepy applications. Digital Angel's first wave of devices will target children, the elderly, and Alzheimer's patients, but future uses may include monitoring the position and health of police officers and firefighters in the field. The technology can even keep track of your dog or cat.

In the future, Digital Angel plans to incorporate more sensors, including to monitor EKG and EEG data. Currently, the watches run on a standard watch battery, but future technology is already in the works that may soon replace the battery with heat cells that use the body's heat to produce energy. These products weren't available at press time, but they are expected sometime in late 2001. Prices aren't set yet, but Digital Angel expects the devices will be available for less than $300.

### Wrist Pilots

Palm-sized computers were once somewhat of a status symbol. It's nothing now to see someone using a palm-sized computer to look up a phone number or shuffle around appointments. Although convenient, palm-sized computers make for just one more piece of hardware you have to carry around. Casio and Timex address this with watches that also function as PDAs. They can even synch data with desktop PCs.

Casio's PC-UNITE watch ($104.95 with plastic band, $129.99 with stainless steel band) uses infrared signals to communicate with your desktop PC. The watch can house appointments, tasks, and contacts, plus perform most standard digital watch functions. A browser application can also store text for later retrieval, although reading text from such a small display is a bit difficult.

The watch bundles an infrared receiver that attaches to a PC's serial port to let you synchronize information without removing the watch. The PC-UNITE's software supports Microsoft Outlook, so you can beam information stored here directly to your watch. Additional software for Palm OS devices and Casio's Cassiopeia palm-sized computers let the PC-UNITE exchange information with standard palm-sized computers. The receiving device must have the software installed to work, so it's unlikely you'll be able to beam information to other PDAs. Nonetheless, this feature is handy for transferring important information from your PDA to your watch without a desktop intermediary.

If you don't own a PC, you can input data directly into the watch, but it's a time-consuming and often frustrating process. You have to use the Mode, Enter, Back, and Adjust buttons to create new entries and the Up or Down arrow keys to cycle through characters for names and phone numbers. Conversely, retrieving information is simple. Press the appropriate button to cycle to the proper mode and use the Up and Down arrows to select the proper entry.

Timex has similar models, but the company's Data Link watches ($65 to $75; www.timex.com) don't need infrared ports to receive information from desktop PCs. Instead, special software transmits data to your watch via blinking bars on the monitor. Several models use the Data Link system, including Ironman Triathlon models and BeepwearPRO models.

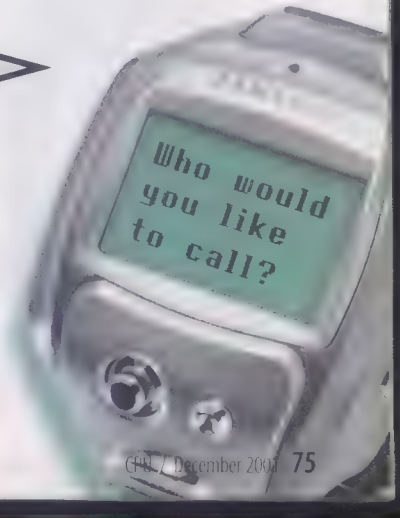
### I Have A Message

With pagers getting smaller and smaller, it's only logical for a company to come forward and introduce a pager/watch unit. That is exactly what Timex has done with its Internet Messenger ($119.95) watch. This time keeper lets you receive e-mail and numeric or alphanumeric pages, plus you can configure the models to receive regular sports, news, and weather updates from Yahoo!, MSN, eBay, Lycos, and other content providers.

The Internet Messenger watches don't have two-way functionality, so you won't be able to respond to your messages. However, you can still receive messages and other information without having to clip yet another device to your belt. Paging service is being offered through SkyTel starting at $4.99 a month for unlimited numeric messages. Alphanumeric service starts at $9.95 a month for 500 messages of 100 characters or less. Paying $99 (about $8.25 per month) up front will get you a year's

### Time To Call

About 70 years after Dick Tracy first used his now-famous watch/phone, Samsung (www.samsung.com) is bringing the concept to reality. The Samsung SPH-S100 lets you place calls directly from your watch, which will run on CDMA networks and feature voice-activated dialing. The watch measures just 2.7 x 2.3 x 0.8 inches and features a battery that provides 96 minutes of talking time and 80 hours of standby time. The watch is currently available in Korea, but Samsung doesn't expect it in the United States before 2002. There's also no word yet on exactly how much it will cost. Future watch versions will feature text-to-speech software for reading SMS and e-mail messages aloud, instead of forcing you to read incoming messages on a tiny display.




### Don't Reach For The Remote

It's inevitable. You settle in just in time for your favorite show only to realize the remote is across the room. Such a crisis forces us to make tough decisions. Stay in the La-Z-Boy and miss the show or walk clear across the room and fetch the remote? With Casio's Wrist Remote Controller ($116.99) on your wrist, you don't have to do either. This watch means the remote is never out of reach.

Casio says you can program the WRC with codes from 22 television manufacturers and five cable box manufacturers. You can also program it to communicate with other infrared-controlled devices, such as stereo receivers or DVD players. The watch's learning mode makes programming easy; just point it at a handheld remote and press buttons for functions you want to control with the watch. The WRC memorizes the infrared signal patterns, and you're good to go.

Volume, power, and channel up and down buttons are included, as is a Video button to toggle between antenna and video signals. A 10-key keypad for direct channel selection is available. The keypad also comes in handy for calculator functions and 16 other functions. Of course, the watch has several timekeeping modes, daily and hourly alarms, and a stopwatch. However, the watch's small buttons can be difficult to press, which makes it difficult to tell if you've engaged a function unless you look for an icon on the LCD screen.

The WRC is more expensive than a cheap universal remote, but a universal remote just doesn't have the James Bond feel to it. Besides, the WRC gives you a trump card in battles for control of the television. A cheaper CMD30B-1A model ($71.99) is available specifically for VCRs. It also controls televisions and cable boxes, but it doesn't work with as many brands and doesn't include a calculator.

worth of service and an unlimited number of messages.

### Dick Tracy Meets James Bond

With technology getting smaller and cheaper, who knows what future watches will feature. Add wireless Internet access and we'll have Internet and intranet access wherever we are. Wireless access with a GPS unit in a watch could help us find your way home or help others find us in an emergency. And why stop at televisions and VCRs? Why not let our watches control the lighting and temperature of our homes? CPU

**by Chad Denton**


### Smile!

Whether it's James Bond, Maxwell Smart, or Austin Powers, a good spy needs a tiny camera. Forget those dubious X10 cameras endlessly popping up in Internet ads. Casio's digital camera/wristwatch is much better.

Casio's original wristwatch camera featured a tiny camera that captured up to 100 grayscale images. Although files were saved to a Casio specific format, you could export them to a desktop PC and save them in bitmap or JPEG formats. Casio has replaced the older model with the WQV3, which saves images in 16-bit color. The watch still features a grayscale display, but images are viewable in color.

Like its predecessor, the WQV3 shoots at a low 176- x 144-pixel resolution. That's good enough to send shots to family and friends around the Internet. The watch's 1MB of flash memory holds up to 80 images. The watch sells for $229.95 with a stainless steel band or $199.95 with a resin band.

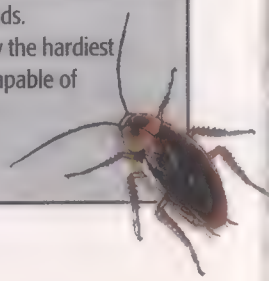
## Infinite Loop

### "I, Cockroach"

Tokyo University's microrobotics team recently revealed information about its use of cockroaches in developing remote control biorobots. These cockroaches with tiny microprocessors surgically attached to their backs can potentially go where no humans can (or would want to) go themselves. Here are the most salient roach-robot facts:

- **Type of cockroach required:** The American cockroach (Perplaneta americana).
- **Type of anesthesia used before surgery:** Carbon dioxide.
- **Limbs removed during surgery:** Antennae and wings.
- **Devices attached during surgery:** Electrodes (where the antennae once resided) and a microprocessor.
- **Weight of the typical bio-robot cockroach:** Approximately 1/20 ounce.
- **Weight of the electrodes and microprocessor:** Approximately 1/10 ounce.
- **Number of cockroaches bred for this purpose:** The exact number is unknown, but it's in the hundreds.

Researchers use only the hardiest recruits, which are capable of lifting 20 times their own weight.



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## Now *YOU'VE* Got Mail

Who among us has not been afflicted with a stack of useless AOL CDs? I've received several over the past few years. So has my grandmother. So has *your* grandmother. If your grandmother is anything like mine, she doesn't know jack about computing, and she doesn't want to.

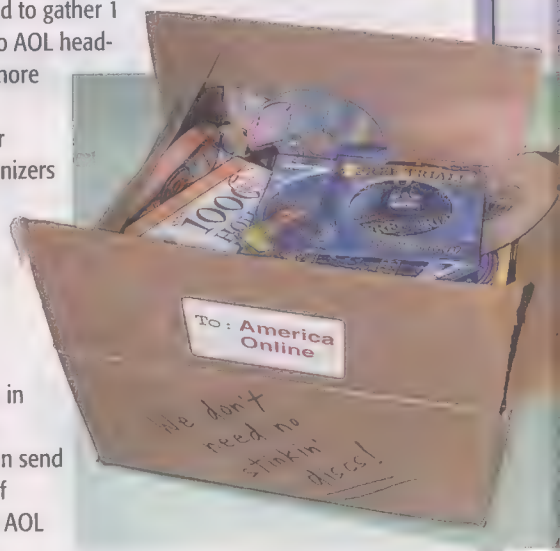
AOL has been pushing its discs on us for too long. It's time to take action. If you're fed up with the AOL CDs avalanche, go to www.nomoreaolcds.com. The folks behind this site are determined to gather 1 million AOL CDs and return them to AOL headquarters. The group has collected more than 2,700 CDs so far.

You can pitch in by sending your unwanted AOL CDs to the site organizers at the following address:

No More AOL CDs!
1935 El Dorado Ave.
Berkeley, Calif., 94707
United States of America

They request that you only send in CDs from AOL or AOL's sidekicks, CompuServe and Netscape. You can send in single AOL CDs or get a bunch of friends together, hunt down all the AOL discs you can find, and send them all in at once.

If you don't feel like sending your AOL discs to nomoreaolcds.com, try to put them to good use. See my top five alternative-use suggestions on the left. ▲




### Top 5 Alternative Uses For AOL Discs

1. Replacement hubcap for Hyundai
2. New official currency of Paraguay: 1 disc equals USD $.01
3. Emergency seventh anniversary gift
4. Tongue depressor for the large of mouth
5. Put two together and make a Sit N' Spin for a small monkey

## Flooz, We Hardly Used Ye!

Remember Flooz, the online currency that was going to change the way we shopped online? The Web cash endorsed by Whoopi Goldberg? If Whoopi Goldberg's involved, you know it's gotta be good. Hollywood Squares comes to mind.

The idea behind Flooz was simple. You could buy fake money (Flooz) with real money (cash, jack, greenbacks, bread, coin) and e-mail the fake money to a friend or relative as a gift. He could use the Flooz to buy anything online, as long as the online retailer accepted Flooz; most didn't. Online shoppers soon realized they could buy stuff online with real money just as easily (or more so) than they could with fake money.

Flooz became nonlegal tender in August 2001 when the company filed for bankruptcy protection, citing "dramatic changes in capital markets and the general slowdown in the economy," which, loosely translated, means, "nobody wants to give us money and nobody wants to spend our money, either." Flooz had never fared well against the Japanese yen or the Deutsche Mark on currency exchanges, which I believe contributed to the company's demise. Thieves in Russia and the Philippines also apparently took Flooz for a ride to the tune of $300,000 in credit card fraud. Flooz's creditors apparently would not accept Flooz as payment for Flooz's bills. ▲

by Michael Sweet

## Real Fun

RealNetworks is all about entertainment. You've spent hours in front of your PC listening to streaming audio and watching streaming video using RealPlayer, and you've ripped all your CDs to shreds with RealJukebox. Now RealNetworks gives you another way to waste time with your PC: playing games. RealNetworks recently released its free RealArcade utility.

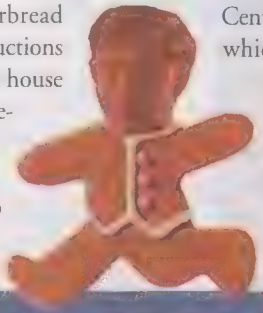
With RealArcade, you can download and install games from RealNetworks' growing library of selections, or you can play Web games online. RealArcade also includes an Online Community section where you can check out message boards and reviews of several games. And for those of you who need it, a Help Desk is available so you can find technical support for RealArcade games if they start acting up.

Most of the games are not of Half-Life/Madden 2001/Civilization 3 caliber, but there are some fun mind wasters here, such as Pitfall: The Mayan Adventure, Diamond Mine, and Pong. Yes, Pong, the progenitor of all computer games. The games are divided among various


categories, including Puzzle and Board games, Action games, Strategy and Sims, and Racing games. The Web Games section includes a streaming games category for broadband users so you can waste time at a much faster rate. You can get your game on at www.real.com. ▲

## Take A Bite Out Of Bill

Microsoft has been chewing up and spitting out the competition for years. Now it's your turn to take a bite out of the company's prime carnivore, Bill Gates. This (tongue-in-cheek) recipe for the Bill Gates Gingerbread Boy comes from the Electronic Gourmet Guide. You can find the recipe at www.globalgourmet.com/food/egg/egg1296/billgate.html; it tells you how to turn Bill into a doughboy using computer parts and gingerbread cookie paste. There are also instructions for making an exotic gingerbread house out of a 20-inch monitor and a notebook. No word as to when we'll see a Steve Ballmer Meatloaf Man recipe or a book of 1,001 ways to fry your PC with Windows. ▲



## Urban Legends

It's natural, though unfortunate, that in times of crisis, rumors and wild stories inevitably erupt. There have been many stories, hoaxes, rumors, urban legends, and lies circulating after the attacks on the World Trade Center and the Pentagon on Sept. 11. The Internet, of course, is the primary medium for spreading these tales. But you can also use the Internet to find out which stories about the World Trade Center attacks are true and which ones are bunk. Go to www.snopes2.com, the Urban Legends Reference Pages. This site lists many of the urban legends surrounding the events of Sept. 11. Click the Rumors Of War link at the top of the page.

The Rumors Of War page displays a long list of various WTC-related rumors and stories and identifies those that are true (one company in the United States banned employees from displaying flags at work), those that are false (photo of a tourist on top of a World Trade Center building as a plane is flying into it; Nostradamus predicted the attack), and those that are indeterminate.

If you're going to use the Web to read up on fantastic stories related to the Sept. 11 tragedy, you should at least go to a site that tells you the facts. The Urban Legends Reference Pages also lists many other categories of Urban Legends, including Music, History, Quotes, Cars, and Travel. It's a good Web site to check out if you want to separate the truth from the trash, and it can also be entertaining. ▲

## "Racecar" Spelled Backwards Is "Racecar"

**Are you perplexed by palindromes? Don't know an anagram from a hole in the ground? Check out the Language Links Web site at pw1.netcom.com/~rlederer/rllink.htm for a huge list of Web sites regarding all things language-oriented. This site has the usual dictionary and grammar links, but it also has links to word game sites and word play sites for anagrams, oxymorons, palindromes, and other amusing language diversions. It was through this site I discovered my favorite anagram: You can rearrange the letters in "William Clinton, the U.S. President" to create "Sin? Lies? Little Downturn? Impeach!" ▲**

If you find a strange, interesting, or funny Web site in the course of your Internet travels that you think is worthy of Fringe, send your suggestion to fringe@cpumag.com

TIME WASTERS

# The Big Dot-Com Party

## It Was Fun While It Lasted

More than an economic boon, the "dot-com era" between 1995 and 2000 often seemed like a licentious party with no apparent end, an orgy of economic optimism, gushers of cash, and boundless youthful energy. For a while, everything from online pet and toy stores to personal calendar services appeared to be sure bets. "You dreamed up the idea in your MBA class and shopped it around and got money for it," recalls Raphael Tamargo, director of equity research, Wilmington Trust.

Then you built a set of extravagant Silicon Valley offices (complete with foozball tables and $800 Aero desk chairs), created indecipherable Super Bowl ads, and waited for the big payoff, going public with an IPO that could net tens or even hundreds of millions. Oh, and along the way, you might actually launch a Web site or maybe even sell some goods or services online, but these were options rather than necessities in an atmosphere of almost wanton enthusiasm for the potential of anything Web related.

But the party ended in April 2000, or at least the caterers started taking their food back, when the NASDAQ generally and Web stocks in particular began an unprecedented plummet. Investors seemed to be running for the exits before the police raided the place. But when did the festivities really begin? How did things get so out of hand so fast?

### And They're Off . . .

The tone, the vision, and maybe even the strange economics of the dot-com party were set on Aug. 9, 1995 when browser company Netscape Communications issued its IPO. Despite the company's negligible revenue and the fact that it didn't even charge users for its only product, the IPO quickly raised over $2 billion and set the terms for the next few years. Co-founder Jim Clark, whose ownership in Netscape made him worth $663 million in a single day, recalls, "[We] were convinced that somehow today would make the world aware of the huge commercial potential of the Web and the Internet. We felt certain we were in the right place at precisely the right time, poised to catch the crest of the information revolution's next big wave."

And it was a belief in the Web's revolutionary impact that drove the boon over the next few years. The Web was supposed to make obsolete large pieces of the consumer economy, moving everything from retail sales to print and TV media and even education to the virtual Internet platform: cheap, accessible to all, and immediately responsive to shifts in consumer wants.

Even though only a small fraction of retail sales in the United States occurred online in 1998 (still today, for that matter), exuberant analysts such as Jupiter Communications' Evan Neufield declared "All of a sudden, the Internet is part of the sales cycle," while others predicted the imminent closing of many physical stores. Under such faith, selling kitty litter (Pets.com), snazzy fashion (Boo.com), or youth-oriented Web TV (TheDen.com) online or just making home pages available to everyone (theglobe.com) seemed like good ideas at the time.

No VC (venture capitalist) wanted to miss the gravy train, and a new set of Wall Street analysts were happy to buttress these dreams. In late 1998, CIBC Oppenheimer's Henry Blodgett predicted Amazon .com shares would hit $400 in a year. Other celebrity Web analysts such as Mary Meeker were famous by mid-2000 for never, ever, recommending someone sell off a Web-related stock.

At one point in 1998, stock valuations made AOL worth more than Xerox and Amazon.com almost as valuable as century-old Sears. Summing up the Web in 1999, dot-com bible *The Industry Standard* (which is now defunct) announced, "Internet business is overtaking the American economy" and that "Everyone—everyone—is betting on the 'Net."

### Long Way Down

And with pride, came the fall. The hubris was that the efficiencies of online commerce and media would change

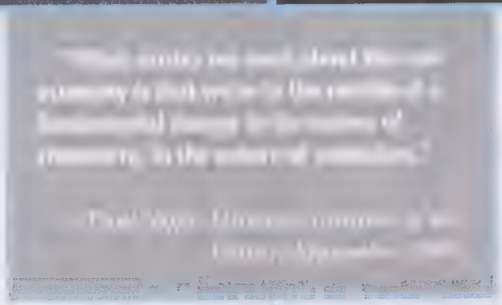
**Before The Fall**

"I couldn't believe my good fortune. The gig came with a VP title, 70,000 stock options (pre-IPO natch), and the promise of 'influencing an entire generation.' . . . By the beginning of this year, the startup world was hailed as the grooviest show in town, the 'be-in' of the millennium."

*— Screenwriter Lori Gottlieb on her days at Kibu.com, which closed weeks after the site's launch*

"Almost 50% of all Net surfers will have their own Web site by spring."

*— The Industry Standard predictions for 2000*



everything and could be applied everywhere. "Name your own price" travel site Priceline.com was a case in point. Soon after an IPO that zoomed 330% on its first day of trading, Priceline.com, which was only a few years old, had a market valuation of over $20 billion in 1999, greater than most major multinationals that had been in business for decades.

The inflated valuation was based wholly on the dream that Priceline.com's system could be applied to any kind of retail sales. Founder Jay Walker believed at the time his model "could rewrite the DNA in dozens of businesses." But it turns out that people did not want to use Priceline.com for groceries, and as these forays into new businesses floundered, the company stock took one of the most famous dives in NASDAQ history, from a high of $165 (April 1999) to a low of $1.06 (December 2000).

Likewise, by early 2000, many other companies were waking up from their dot-com dreams to see that people didn't want to buy much pet food online, or, as some once dreamed, cars and houses. The losses mounted.

**Showing everyone their money . . . for a while.** Not only were the economic fundamentals of these companies proving to be hollow, but many suffered from downright bad behavior and profligate spending habits that begged for a comeuppance. Newly minted dot-com millionaires became infamous for washing down hamburger lunches with a showy $1,500 bottle of Bordeaux or renting yachts for $150,000 a week. The industry was rife with hype-driven, mismanaged failures such as TheDen.com that helped fuel growing fears that the dot-com craze was a bubble waiting to burst.

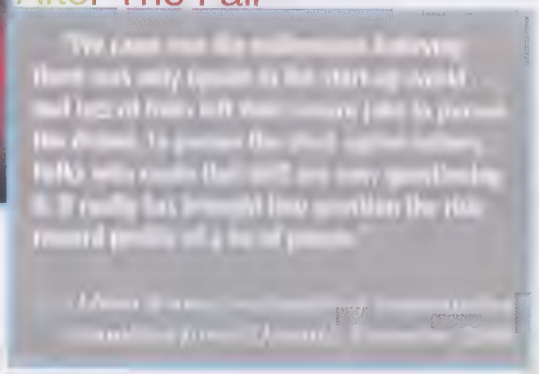
> "It may not be the best way to sell dog food, but the 'Net continues to add a lot of value to our lives."
>
> — Scott McNealy, CEO Sun Microsystems, June 2001

And it did, officially, during the week of April 14, 2000. Financial wizards already had been complaining that the valuations on many Web companies were outrageous, Tamargo recalls. Once the Federal Reserve Bank started raising interest rates in early 2000, "the flow of capital tightened and that meant that it was going to become much more difficult for some of these Internet stocks to get funding, and that started the snowball effect." Beginning on March 13, 2000, the NASDAQ, on which most tech and Web stocks traded, started a breathtaking fall, from a high of 5132 (March 10) to 3958 by May and then 2750 by the end of 2000, losing half its value in under a year.

Dot coms led the carnage, then and since, because so few seemed even close to making money. By mid-2001, most of the major Web company stocks such as Yahoo! and CMGI were off 90% or more, and between January 2000 and August 2001, 642 Internet companies failed, according to WebMergers.

### Picking Up The Pieces

Even as the dot-com orgy ended, many Webpreneurs blamed their failures on VC impatience or the implosion of the online ad market. In mid-2001, media analyst Jack Myers may have supplied the most trenchant answer to this lingering whine. "Instead, they should be laying blame squarely on the shoulders of inexperienced and incompetent management and investors who created unrealistic expectation for an emerging and mostly unproven medium."




Dot coms are down, but far from out. Sites such as eBay and Travelocity have proven that the Internet *can* revolutionize some marketplaces such as travel or invent new ones such as person-to-person e-commerce. But after a fall comes humility. The enthusiasm for what the Web can do for us is still there, but most companies have returned to fidelity: a renewed faith in the fundamentals of fiscal restraint, viable business models, and reasonable expectations.

Even the most fervent new economy cheerleaders such as Scott McNealy, CEO Sun Microsystems, now couch their optimism by admitting, "It may not be the best way to sell dog food, but the 'Net continues to add a lot of value to our lives." The question for the remaining dot coms is exactly what value the Web does bring, and what are people willing to pay for it? CPU

**by Steve Smith**

# Inside WildTangent™

## Delivering High-End 3-D Content To A Web Site Near You

If at first Microsoft doesn't succeed, try it yourself. That's the attitude Alex St. John and Jeremy Kenyon took when they grabbed the idea behind a canceled Microsoft project and started WildTangent (www.wildtangent.com) in about 1,000 square feet in the basement of St. John's home in July 1998. *(Full Disclosure: Alex St. John is a columnist for* Computer Power User. *See his column on page 13.)*

Flanked by about a dozen employees, WildTangent set out to create high-end, interactive 3-D Web sites. But we're getting ahead of ourselves here. To give you the full picture, we'll start from the beginning.

### The Idea

Microsoft critics love to harp on what they consider one of the company's greatest flaws: its failure to innovate. But even Microsoft bashers can't apply that tag to one Microsoft product: DirectX. The creation of DirectX by Alex St. John, Eric Engstrom, and Craig Eisler didn't exactly follow Microsoft's culture or normal chain of command, but it has grown into one of the company's best products.

These three men (at least initially) moved from DirectX to the Chrome project, an idea for delivering 3-D graphics across the Web, regardless of the speed of the user's connection. After a few years, with only Engstrom left actively on the project, Microsoft killed the idea. But before Microsoft canceled Chrome, St. John had enlisted the help of friend Jeremy Kenyon to start WildTangent.

### The Team

From its humble beginnings in St. John's basement, WildTangent eventually moved operations to the Microsoft campus where it served as a consulting organization to Microsoft for developing Chrome. By this time, St. John was no longer working for Microsoft, but he kept in touch with Engstrom, who oversaw the Chrome project.

Engstrom eventually convinced Microsoft to hire St. John to write the white paper for Chrome, later renamed Chromeffects. After Microsoft canceled the Chrome project a few months later, WildTangent picked up the pieces, leaving the Microsoft campus for other office space in Redmond, Wash. "I thought, 'If they're not going to do this, I'll make a company out of it,' " St. John says. "I'd be foolish not to pick it up."

WildTangent, a privately financed company, raised $2 million in venture capital in 1999, $15 million in 2000, and $34 million in 2001. Surely part of this success can be attributed to the company's "dream team" of developers. Of course there's


Visitors to the WildTangent Web site can play Speedway through the Web after downloading Web Driver software.

Jeremy Kenyon, CTO and co-founder of WildTangent, who holds degrees from Cambridge University. St. John says about half of the original DirectX team from Microsoft now works at WildTangent. Developers now at WildTangent worked on a variety of games in prior jobs, including Quake II and III, NFL Blitz, TriplePlay 2000, Wing Commander IV, and Diablo II.

"There are special people out there, but they never make themselves easy to attract," a laughing St. John says about his development team. "We have famous artists and game designers who enjoy the atmosphere.

## The Road To WildTangent

Sources: WildTangent and "Renegades of the Empire," by Michael Drummond

**1994**

St. John, Engstrom, and Eisler begin work on DirectX, dubbed the "Manhattan Project."

**1997**

Microsoft takes control of the DirectX project, leaving the three men free to begin developing the Chrome project. Microsoft and St. John eventually agree to part ways.

**1998**

- Microsoft, unable to secure copyright, changes the name of Chrome to Chromeffects.
- Microsoft pays St. John to write the Chromeffects white paper.
- St. John starts WildTangent in July.
- During an October reorganization, Chromeffects is taken away from Engstrom; the project is eventually canceled.

**1999**

- WildTangent releases the first beta of Web Driver in May and version 1.0 in September.
- WildTangent raises $2 million in venture capital in February.

You can crank out game ideas without needing a huge amount of resources. We are attracting some very special people."

### The Technology

WildTangent's major technology to date is Web Driver, which consists of two pieces of software: a plug-in for Web browsers and an SDK for developers.

For end users, Web Driver uses compression technology to allow high-end graphical files, including 3-D geometry, audio, and bit-mapped files, to move across the Internet in a reasonable timeframe, even across dial-up connections. The compression can be greater than tenfold, significantly cutting download times. Web Driver also provides a software driver that connects hardware components in the computer directly to the Internet, making them work more efficiently.

"We make it practical to deliver games over a wire," St. John says.

For developers, the Web Driver SDK gives them the ability to work directly with DirectX APIs through Java, JavaScript, and VBScript for improved hardware performance. Because Web Driver handles the compression, hardware acceleration, and other problems, developers can concentrate on creating content. Web Driver functions much like DirectX in that regard.

WildTangent's Web-based games, such as SabreWing 2, are near CD-quality.

WildTangent gives access to its Web Driver technology to developers and users for free. However, once the technology appears in a commercial application, WildTangent collects revenue. The company generates other revenues by creating unique content for companies.

### The Future

WildTangent's technology promises to significantly change the way developers create games and users play games. Because of the way Web Driver works, development teams can consist of a few people working for less than six months to release a game instead of teams of as many as 20 developers working for two or three years.

Using WildTangent technology, developers can create games that appear in segments or episodes. These can create smaller games, place them on the Web for free, and see whether users like them. If users enjoy the game, developers can create more episodes of the game and sell them. Because development time is a lot lower, games can cost less than $10 per episode instead of $30 to $50 per title. Faster game development also means developers can take advantage of the latest hardware and technology more quickly.

Other games could be free, regardless of how many episodes a developer creates, either through direct sponsorship by a company or through advertising placements. St. John says movie companies already have had success working with WildTangent to develop Web-based, 3-D games to generate vastly increased Web hits for a film instead of asking users to download 50MB trailers or showing visitors screen shots. Using this method, movie companies can release games ahead of a movie's release, generating additional buzz. Under traditional game-development calendars, movie-related games might not appear until after a movie has long since exited theaters.

The future looks good for WildTangent, which had 140 employees in mid-2001. It's possible more than 60 million users might have Web Driver software loaded on their computers by the end of 2001. Without discussing specifics, St. John says CEOs of major companies are beginning to contact WildTangent, rather than vice versa. And with investment partnerships already in hand with companies such as Sony Pictures Digital Entertainment, Accenture Technology Ventures, and Washington Mutual, it's clear WildTangent has grabbed the attention of top firms. CPU

**by Kyle Schurman**

**2000**

- WildTangent brings several games and products to the Web.
- WildTangent raises $15 million in venture capital in March.

**2001**

- WildTangent releases Web Driver 2.0.
- WildTangent raises $34 million in venture capital in April.

## Where The Wild(Tangent) Things Are

You can check out content created by WildTangent at these sites. ▲

**EA.com**
*Meteor Madness*
www.ea.com/worlds/games/gm_mtrmad00/home.jsp

**GameSpy Arcade**
*Dark Orbit*
www.gamespyarcade.com/webgames/action/dark_orbit.shtml

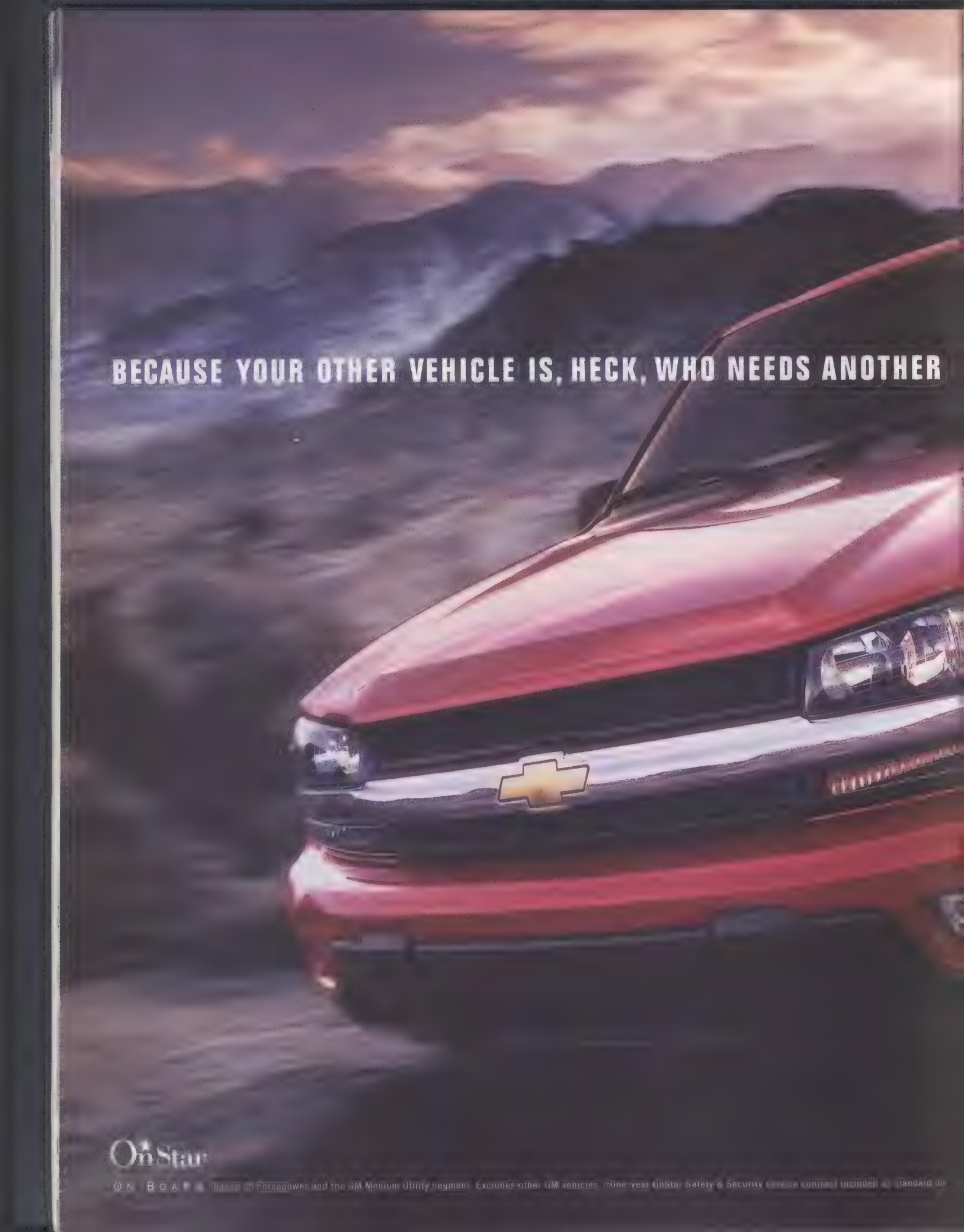
*Atomic Pop*
www.gamespyarcade.com/webgames/classic/atomic_pop.shtml

*BlasterBall Wild*
www.gamespyarcade.com/webgames/classic/blaster_ball.shtml

**A Knight's Tale**
www.aknightstale.com/index.php

**Mapstream**
www.mapstream.com

**MSN Game Zone**
*Toyota's Tundra Madness*
zone.msn.com/madness




*Based on horsepower and the GM Medium Utility segment. Excludes other GM vehicles. †One-year OnStar Safety & Security service contract included as standard on


You've seen them. Bumper stickers that laud the "other" vehicle. The one you *want* to be seen in. The one that *performs*. The *luxurious* one. Well, the 2002 Chevy® TrailBlazer™ is all that and more.

## INTRODUCING THE ALL-NEW CHEVY TRAILBLAZER

As the world's most powerful midsize SUV, TrailBlazer has the new Vortec™ 4200, a six-cylinder engine that serves up 270 horsepower — more power than any of its V8 competitors. But it isn't just more powerful. TrailBlazer was also designed to be the strongest midsize SUV ever. Luxurious, too. With everything available from an in-dash six-disc CD changer to Premium Leather seating surfaces to the security of OnStar®. The ride is comfortable as well, thanks to its new five-link rear suspension system. The all-new TrailBlazer. It's one strong SUV. And one strong argument for owning only one vehicle.

**TRAILBLAZER LIKE A ROCK**

by Lisa Lopuck

# Hired Guns:
## Small, Fast & Cool Web Design

*Lisa Lopuck is an award-winning designer, an international speaker, and a best-selling author. She has been on Macromedia's Fireworks advisory board since the product's inception and has consulted for numerous Internet companies in the Bay Area. In 1998, Lisa founded eHandsOn.com, an e-learning content management company. In 1996, Lisa co-founded and served as Creative Director of Electravision, an award-winning Web design studio.*

The downturn in the economy has forced companies to dramatically cut their Web design budgets. While just two years ago it was not uncommon for companies to spend upwards of $500,000 on a highfalutin Web design firm to design a highfalutin Web site, nowadays these companies are hard pressed to justify anything over $50,000 for Web design expenses. Over the last year, the net result has been a mega implosion of big Web consultancy firms around the nation, putting a lot of talented Web designers out of work and on the street.

While the designers who have never worked outside a big company may be running for the unemployment line, those who have a measure of consulting experience may find working for themselves more lucrative than they thought. Though companies are not quick to spend hundreds of thousands of dollars on Web sites, they are spending between five and fifty thousand for smaller-scale projects, which are perfect for the small, fast, and cool design team.

**In the past, companies would hire big-name design firms for what I can only imagine are the bragging rights that came with them.**

### Go Virtual

Out of necessity, companies are also changing their attitude about the design consultants they hire and how they work with them. In the past, companies would hire big-name design firms for what I can only imagine are the bragging rights that came with them. In return, companies got questionable service and imagined better quality, but at least it cost too much!

In this market, companies demand teams that can deliver quality work at drastically reduced rates. Such demands are easily met by small virtual teams assembled on the fly on an as-needed basis, "commando style." Usually these teams are assembled by a lead marketing or creative consultant retained by the client for a particular project. The lead consultant handpicks a team of other independent consultants, and they are off and running, usually holding kick-off meetings at Starbucks branches around the country.

The assembled virtual team of designers, writers, marketers, and programmers works out of their homes, stays connected via e-mail and conference calls, and meets at coffee shops or at client offices. The team is efficient; the work is excellent. (Remember, these are the same people who big design firms were formerly billing out at $400 an hour.)

Here's an interesting case in point. I recently collaborated with one other person on the complete redesign of a Web enterprise software product. The project took three months of personalized service to overhaul the user interface and visual design of the company's flagship product. If the company had gone to a large Web design agency, the cost would have been a few hundred thousand dollars. Having worked at large agencies before, I'm certain that we delivered the same level of quality and expertise—perhaps more—than a large firm would have provided, but we charged the company under fifty grand. With home offices and only ourselves to pay, the margins are quite good.

### Connecting The Dots

While small, fast, and cool virtual teams are just the ticket many companies need now, the real issue is how do these companies find good people for their Web projects. Short of asking around for recommendations, companies will have to do their homework and be open to the idea of small teams of consultants.

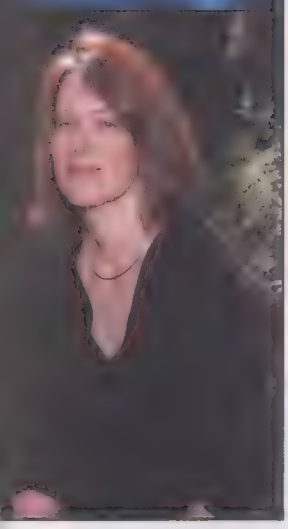
Most consultants have their own Web sites with portfolios and client lists, but finding their Web sites is not always easy. What consultants and companies both need right now is a centralized, online talent directory service. Before such a resource is organized, however, companies will have to search the Web for leads. Independent designers must also make sure their sites are searchable with good page titles, meta tags, and alt tags.

In addition, designers should think about targeted marketing campaigns for their unique services. For example, designers who specialize in developing trade show marketing sites and Flash movies should consider sending HTML e-mails to marketing directors and VPs. In light of today's economic realities, those of you on the receiving end of these e-mails may be doing your company a financial favor by actually reading them. ■

*You can reach Lisa at lopuck@cpumag.com*

by Joan Wood

# IM: The Message Is The Message



*Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment where she produced the two Cyberia games. Before 3-D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.com, where she was co-founder and managing editor, Joan has retired.*

Despite what your boss may think, Instant Messaging (IM) is not just an Internet sticky note or a safer way to flirt. When utilized properly, it is nothing less than a new form of advanced communication. As long distance collaboration becomes increasingly mandatory, effective IM communication skills will be essential to success in all types of business and production environments.

Sorry, was that too corporate? Well, try this: You manage a computer hardware review Web site. Your designer is in Sweden, the test lab in Silicon Valley. Writers and editors are spread from Tennessee to Singapore. The still-being-customized ASP publishing tool developer is on the East Coast, and you have an embargoed deadline on a 28 page article (with benchmarks!) that needs to be organized, edited, fact checked, and published within the next few hours. This task is not even possible without some form of IM.

**If you wait for IM to be perfect, you may as well use smoke signals.**

Fast, flexible, and evolving, IM already goes way beyond chat and file transfer. Voice and video transmission, application sharing, tandem browsing, even spell checking and language translation (results still laughable, but improving) are incorporated into free IM services. Their most serious shortcoming has been security. Do NOT transmit classified or sensitive information like credit card numbers, passwords, or those pix of you at the Chucky Cheese Emporium across free public IM services like AIM, ICQ, MSN Messenger, and Yahoo! Messenger.

These services are similarly featured and, security issues aside, their primary inconvenience is the inability to message between them. The adoption of a unified standard may remedy that eventually, but until the proprietary vs. open source debate finds common ground, there are handy programs like Trillian, Imici, and Jabber that enable "least common denominator" interoperability (at least for now) across multiple IM services so long as you have active accounts with each one.

More sophisticated enterprise apps like Groove and TeamSpace have greatly expanded features and solve the security issues of sending private info over the public net and the risks involved in opening ports to the outside, thus making your IT department less resistant to installing them. By incorporating shared workspaces, some stored on servers, others locally, these programs create a complex virtual work environment for long-distance collaboration. Already integrated with Windows Messenger, Groove has attracted the attention of DARPA, a plump $51M check from Microsoft, and .NET blessings. It is still available for free download in the handy trial size and should give some good indication of how we all will be working in this changed world. But which IM software you choose isn't nearly as important as developing the complex communication skills needed to use it to full effect. Once you become fluent in remote collaboration, you can use whatever's going.

Whether you are creating a Web site, a computer game, or a monthly sales report, the challenge of clear communication in these shared environments is the same. Even in its most basic form, IM leads to some uniquely skewed conversation formats. Because both parties can compose messages simultaneously, dual-topic conversations tend to emerge, wherein you are responding to the other person's question while they respond to yours. This intertwined multi-threaded discussion requires a bit of concentration to keep topics coherent but speeds up the overall flow of information, and practice in this area will serve you well when managing complex projects. And adding video/audio/graphics doesn't necessarily make communication easier. If talking to a morphing pixel head during a bandwidth slowdown throws you off guard, you have to be prepared to compensate.

The bottom line: If you want to choose the type of work you do, where you do it, and with whom, you had better get comfortable using IM now because if you wait for it to be perfect, you may as well use smoke signals. But tell your boss you are investing in corporate communications infrastructure, not waffling on AIM.

Now Playing: Trillian, www.ceruleanstudios.com (for ICQ, www.icq.com and AIM, www.aol.com); Paralink, www.paralink.com; NetMeeting, www.microsoft.com; Groove, www.groove.net. When in doubt, Google. ■

*You can reach Joan at joan@cpumag.com*

# At Your Leisure

Compiled by Samit G. Choudhuri & Chris Trumble

## Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in game consoles, games, PCs, DVDs, and just stuff we love, read on.

### Pretty In Green

The struggle between video game console companies each year around the holidays is always interesting, but there's an even greater sense of curious excitement in the air this year. Microsoft is venturing into the video game arena for the first time with its own console.

Xbox is due November 15, after having been quietly pushed back from an original launch date of November 8. Armed with a 733MHz Intel CPU, a rip-roaring NVIDIA graphics chipset, and an internal hard drive (all for $299), the Xbox has the potential to dent the armor of Sony's PlayStation 2, the current market leader.

Xbox's PC-style architecture makes it easy for PC game developers to create Xbox adaptations of their products. Early indications also show strong support for the console among console developers. Eidos, Konami, Capcom, Electronic Arts, and former hardware contender Sega have all signed on to produce Xbox versions of many of their best and brightest titles.

Of course, Microsoft itself will publish a number of games that look pretty good so far, although we haven't gotten much hands-on time with some of them. Bungie Studios' Halo should sell a few systems on its own, and from what I've seen, Microsoft's NFL Fever 2002 looks like a potential hit, too. The playable version Microsoft showed at E3 in May had flashes of the graphical splendor of EA Sports' Madden NFL 2002, combined with freewheeling control similar to that of Sega Sports' NFL 2K2.

That's not to say that breaking into the console market will be easy, even for Microsoft. Questions have been bouncing around lately about manufacturing delays, the actual size of the Xbox hard drive, and how much support Xbox will get in Japan. Microsoft clearly has its work cut out for it, but with a $500 million marketing campaign and the right developer relationships, Xbox could be a contender. ▲

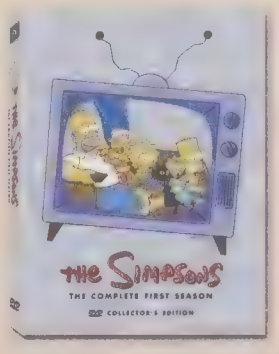
Microsoft's Xbox struts its green, Tommyknockerish stuff.

**Xbox**

**$299**
**Microsoft**
**www.xbox.com**

### DVD Byte

At long last, you can now own "The Simpsons" on DVD. That's 13 episodes, in 22-minute bites, spanning three DVDs, for $39.98 (at press time Amazon.com had it for $29.95 and Buy.com for $27.99). You aren't just paying for the laughs, either. One platter has scripts, outtakes, audio commentary, early sketches and drawings, a short from "The Tracy Ullman Show," and more. We would have liked *all* the shorts from "The Tracy Ullman Show" (where "The Simpsons" got its start). D'oh! Damn copyright issues. Still, this is a package that no real fan should be caught without. ▲




"The Simpsons: The Complete First Season" is now on DVD. It's a guaranteed good time. We can't wait for season two.

# Pigskin Paragons: A Look At Two Of The Best Football Video Games EVER

**Madden NFL 2002 (PlayStation 2).** This game is a thing of beauty, wringing so much graphical splendor from the PS2 that at a glance you might think you're seeing an actual NFL game on television. Occasionally, you'll catch a glimpse of a player's head that's a tad too large (an unfortunate but livable effect of the game's amazing face-rendering technology), or a sustained shot of the improved-but-still-wooden crowd, but for the most part the game is flat-out *gorgeous*.

Madden 2002 doesn't stop there. The game's control scheme is extremely tight and fairly intuitive, as is its play selection interface. If you've played Madden at all in the last few years, you shouldn't have much trouble, although the game is a bit more demanding this year in a couple of ways. First, like the 2001 version, Madden 2002 doesn't allow the kind of cartoony cuts and physics-defying moves some football games do. You can cut, but it takes a second or two, depending on which player you're controlling, and you won't have as much momentum coming out of a 90-degree juke as you would upon executing a soft slant.

The game's AI also requires more intelligent play selection than in years past. In the good old days, you could find one or two plays that worked consistently and hammer your computer opponent into a filmy paste, but such cheapness won't fly in Madden 2002. In fact, some might find the learning curve a little too steep at first, but thanks to an easy play mode and the game's training mode (where you work on specific plays and formations until you get them right), you can learn the skills you need to excel with a little time and diligence.

Oh, and it has a fantastic multi-player mode, as well. The end result is a game that is both beautiful and genuinely challenging, and right now you can't buy a better all-around football game for any console. Period.

Madden 2002 is so realistic it's scary. Here, Daunte Culpepper shrugs off another feeble sack attempt.

Sega Sports NFL 2K2 brings fast, furious football action right into your living room, complete with a loose, arcadelike control scheme.

**Madden NFL 2002**

**$49.95**
**EA Sports**
**www.easports.com**

**Sega Sports NFL 2K2 (Dreamcast).** I've been a fan of the NFL 2K series since its inception, and I'm happy to report that 2K2 is every bit as good as its predecessors. It's not quite Madden 2002's equal in the graphics department (although in all fairness we haven't played the PS2 version yet); textures look a little blockier and players' facial animations are less realistic. But the game still looks great and has a loose, arcadelike control scheme that some players will definitely prefer to the stiffer, physics-based control model in the last couple versions of Madden.

Many aspects of 2K2 are very similar to their 2K1 counterparts, but one refinement that really stands out is the game's play-selection controls. Instead of moving the cursor in a track along on-screen menus to highlight items you want like you had to before, you can move the cursor freely around the screen's entirety. It springs back to the center if you let go of the analog control stick, which means you won't have to move differing distances and directions each time you select a specific item. This isn't a big deal, but it makes selecting game options easier than last year.

The game's AI provides a pleasing blend of difficulty and simplicity. Although the CPU opponent isn't a pushover, you won't have to spend days and weeks learning the technical aspects of each formation to win a game or two. The multiplayer mode is a blast, and thanks to Dreamcast's online capability you can play with as many as eight players at once.

This game is a great buy for Dreamcast owners, especially considering it costs 40 bucks. At press time, Sega planned to release a PS2 version in October and one for the Xbox in December.

**Sega Sports NFL 2K2**

**$39.99**
**Sega**
**www.sega.com**

## Max Payne Goes Bullet-Time

Being an undercover cop isn't easy, but there's so much to live for. Until one day, that is, when you come home after a long day on the job and find your wife and baby daughter murdered. And, you're framed for their deaths. Thus begins Max Payne from Remedy Entertainment.

Players step into Max's shoes, playing from a third-person camera view. Some will argue that the dialogue and story are a bit cheese-laden, but it works pretty well within the confines of the game world. B-movie film noir elements in an action game never hurt. Gameplay in Max Payne shines brightly. Right-click the mouse to enter the innovative Bullet-Time mode. Here, the world slows down as you hear Max's muted heartbeat pumping in the background. Flying through the air for these interminable seconds, you can still shoot at lightning speed. This is a feature we thought might fall flat in the final product, but it adds a great deal of depth to gameplay.

You won't buy Max Payne for its story, sound effects, or strategy aspects (though there are always exceptions.) You'll buy it for the gameplay, fast-paced John Woo-style action, and gorgeous graphics. A powerful PC with the latest hardware goodies is a must to really enjoy the game in all its graphical glory. Max Payne presents plenty of action, mixed sinfully with graphical delights. You won't find a better-looking action game this year. ▲

**Max Payne**

**$49.99**
**GodGames (publisher)**
**www.maxpayne.com**

## A Classic Return

We first reviewed the Microsoft SideWinder game pad back in 1996 on a Windows 95 system. That was before USB, when Microsoft used the SideWinder joystick's digital overdrive technology to eliminate the IBM hardware restrictions game controllers had when used in PC multi-player games on one PC.

A key innovation in 1996 let users chain up to four controllers together via built-in connectors. The only other option back then for playing with multiple game pads on a single machine was the Gravis GrIP. It connected through an external Gravis hub. Sure the old SideWinder didn't have the MS-DOS support that Gravis did, but that obviously isn't an issue any longer for the majority of gamers.

Many of us have questioned why Microsoft didn't release the original design with USB support during the past few years. It churned out decent SideWinder game pads, but nothing to replace the original. So we simply waited.

Fast-forward to the present, and Microsoft has finally seen fit to update the original. Cleverly dubbed Microsoft SideWinder Game Pad USB, the attractive 10-button (eight buttons and two triggers) controller has become a fast favorite. As a bonus, it works and plays just like the original (only better). We tossed sports and racing games at it and have been happy to rediscover the classic, rugged feel. The SideWinder Game Pad USB no longer includes an option to daisy chain controllers, but that's not a major issue anymore, especially for a quality product costing less than $25. Heck, just go buy a standard USB hub to fix that problem.

The game pad requires Windows 98 or later running on a Pentium 166MHz-plus machine with a USB port. ▲

**SideWinder Game Pad USB**

**$24.95**
**Microsoft**
**www.microsoft.com/sidewinder**

### Check These Out

Check out our reviews of **Red Faction** (PS2), **Resident Evil Code Veronica X** (PS2), and **Twisted Metal Black** (PS2) at www.smartcomputing.com/cpumag/dec01/gamereviews. ▲

# Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Graphics mean nothing. Got that? That said, remember how awesome games like Alone In The Dark, Quake (3-D accelerated), and Falcon 3.0 looked in their heyday? We all know that eye candy doesn't hurt. There's nothing better than stellar gameplay combined with drop-dead knockout graphics to make that killer game. These games have potential.

**Unreal II**. Action fans take note: Developer Epic Games and publisher Infogrames are going to have a giant hit on their hands when this title drops on store shelves in late 2002. It's all we can do to not drown in our own saliva right now (an unpleasant demise to be sure). Check out the fog-free vistas, flame thrower effects, gorgeous textures, and—erm—the rest.

**Comanche 4**. Novalogic has come a long way since the Voxel- endowed Comanche from the early 1990s. Sikorsky has been feeding the design team all sorts of good data, and the game should appeal to both action and sim gamers.

## Infinite Loop

### The Price Of Power

Massively multiplayer games such as Asheron's Call and EverQuest may take place in a virtual world, but they cost real money. You can spend months building up a character and collecting items, or you can follow the path of many intrepid adventurers and buy your way into the realm. Be prepared to part with a lot of coin, though. Check out these recent eBay bids for characters and equipment for two of the most popular online games.

**Asheron's Call**

Level 89 Mage: $600

Stave of the Quiddity: $10.50

Life Magic Mystery Self 6 Scroll: $4.99

Gold Horned Helm: $3

**Ultima Online**

Large tower located on Ice Island in Felucca: $300

Daemon Bone Armor: $12.99

Katana of Blood Drinking: $9.99

1 Million Gold: $49.99

SPECIAL BOOK PREVIEW

# First Look:

# The AnandTech Guide To PC Gaming Hardware

Sn you get single-digit frame rates when "playing" the latest FPS games? Ouch! You find yourself walking down the aisles of your local software retailer gazing longingly at the latest games? Sounds to us like you're in the market for a new power rig. You could buy one off the rack, but aren't you a gamer that wants to squeeze every last piece of power out of your new PC? We think you might be. We suggest you build a customized hot system with the help of hardware guru Anand Shimpi, the man behind AnandTech.com and book author. *(Full Disclosure: Anand Lal Shimpi is a regular columnist here at* Computer Power User *magazine. See his column on page 37.)*

Taken from Chapter 4 (Memory: Your PC's Scratchpad) . . .

**The Role of System Memory.** "I need more memory!" That statement has been made countless times by upgraders with slow game frame rates that very often didn't need more memory. Your memory subsystem just happens to be one of the easiest things to blame for poor performance. Saying "I need a new motherboard" is a bit more technical than saying "I need a new CPU" or "I need a new computer" for many. The result of this is that very little attention is paid to memory other than how much you happen to have in your system. And although memory size is indeed an important characteristic of your system, many more things need to be considered outside of memory size.

I have actually already introduced you to a type of memory, cache memory, back in Chapter 1, "The Central Processing Unit: The Heart and Soul of the PC." I described cache memory as really fast memory because it is transistor-based much like the rest of your CPU. By being transistor-based, data is stored in the cache according to the state of the various switches or transistors that make up the cache. The state of the transistors does not change unless it is instructed to or unless the cache loses power (you turn off your computer).

The memory I am talking about now, however, isn't as pleasant as cache; this is system memory. System memory is the stuff that lies on the other side of the North Bridge/MCH (Memory Controller Hub) and is connected to the North Bridge/MCH via the memory bus. System memory, unfortunately, isn't transistor-based; instead, it is capacitor-based. A capacitor, if you don't already know, is an electrical device whose sole function is to hold an electrical charge. The capacitor charges up by applying an electric current over it and is discharged when the electric current is removed. This is unlike a transistor in that the process does not occur instantaneously. When you hit a light switch the connection is made and the circuit is complete. On the other hand, when you fill a glass with water, the process isn't complete until all the water has entered the glass. This is the difference between a transistor (the light bulb) and a capacitor (the glass of water).

So instead of making use of electrical switches, system memory uses capacitors with stored charge to indicate a 1 or a 0 value (remember, you're still in binary). This is similar to the cache I have been talking about in that when the power is removed from the memory, the data is lost. However, many more important differences exist between system memory and the L1/L2 caches explored in Chapter 1.

**Comparing System Memory and Cache Memory.** The major difference between your system memory and your cache memory is that because of the nature of a capacitor, which requires that it be charged as well as refreshed to maintain that charge, system memory is noticeably slower than the CPU caches I talked about earlier. The unfortunate part about this reality is that much more of your data is stored in system memory than it is in cache, so you get to deal with the higher latencies of capacitance-based memory.

It is often jokingly asked: "If the only thing that survives a plane crash is the black box, then why not make the entire plane out of the black box?" And in the computer world, it is often asked: "If system memory is so slow compared to cache, why not make everything out of cache memory?" Just as the case with the first question, things aren't as simple as that.

The major problem with the cache used in CPUs is that it is quite costly to produce when compared to system memory. Because it is capacitance-based, system memory is of


Let author Anand Lal Shimpi guide you through building your next gaming über-rig.

a relatively simple construction. The switching nature of CPU cache requires many more components to create the same effect. With small sizes such as 256KB and 512KB, cache memory is relatively affordable, but if you realize that today's performance machines are using 256MB and 512MB of memory the cost associated with transistor-based memory is simply too great.

So now that you can tell the difference between cache and the system memory I'm going to be discussing, what makes it so important to you and the games you are playing? After all, aren't games only dependent on a strong FPU?

Although it is true that 3D games, such as NHL 2002 and Max Payne, do benefit from a CPU with a strong FPU, gaming is much more than just performing a lot of calculations. The calculations your CPU is doing only pertains to the position of the objects on your screen and what they're doing, but your CPU has to be getting this data from somewhere. The actual game you're running is loaded into memory from your hard disk or CD/DVD-ROM drive. From main memory, the CPU is sent data via the memory bus to the North Bridge/MCH then via the FSB to the CPU's caches.

Today's games can take up well more than 50MB in memory, which is just a *tad* too big to fit in the 384KB exclusive cache of the Athlon. Note that when I refer to memory here I am referring to system memory. Too often people mistake system memory, or memory as it is simply referred to, as being hard disk space. This type of "memory" is a completely different issue, which I discuss in Chapter 7, "Storage: The Slowest Part of Your PC."

As you can guess, it is much slower for your CPU to have to pull data from memory when compared to how long it takes to pull data from its caches. When your CPU needs a piece of information contained within its cache, even the L2 cache (assuming you've got a Pentium III Coppermine, Athlon Thunderbird, or better), all it has to do is pull from its on-die cache, which is operating at the CPU's clock speed. When your CPU can't find what it needs in its L2 cache, it must go to system memory that is significantly slower and much further away. You can analogize this to the following scenario in which you need to add more milk to your breakfast cereal. Getting "milk" from cache is the equivalent of having the carton sitting right next to you while you eat. However, if it's not right there, you end up going downstairs to your refrigerator for it, which takes a bit more time. The first way is by far the quickest and the most convenient, but if you have no milk you have no option but to make the trek downstairs, which is a necessary evil albeit much slower. However, it is taking it to the next step, which is having to get information off your hard drive. That would be more like discovering you had no milk left and had to get in your car, drive to the store and come back just so you can finish eating your cereal in the morning. If your CPU doesn't have the data it needs, it has to get it from somewhere, slow or not.

**Bandwidth and Latency Still Apply.** Chapters 1 and 2, "The Chipset: The PC's Crossing Guard," contained a great deal of talk about bandwidth and latency. That material applies here as well. Remember that your CPU is only as fast as the speed at which it is given data to process. If a 10GHz CPU is waiting around on a slow 10MHz memory bus to feed it data, much of that CPU power is going to waste and it shows up in a game's performance. The greater the bandwidth and latency difference your CPU sees between accessing data from its cache and getting data from system memory, the more likely your system is going to be performance limited. When this happens you notice that upgrading to a CPU that has a 33% higher clock speed might not provide you with nearly as much of a performance boost as you'd expect. The best case scenario is that such an upgrade would give you a 33% boost in performance, but if you're bottlenecked by your memory subsystem, that increase could be cut down to less than 10%. The ability for CPU performance to scale with clock speed is dependent on it being able to be fed by its FSB and memory subsystems.

System memory latency matters quite a bit because the higher the latency the longer it takes for the CPU to get the data it needs. Remember that the CPU always has a reasonably high latency when getting data from main memory because it must go to the North Bridge/MCH via the FSB, and then to system (or main as it is sometimes called) memory via the memory bus and back. The fact that the CPU has to go through the North Bridge/MCH adds a relatively significant memory latency penalty. Unfortunately, it is one that can't be avoided, which is not to say, however, that designers haven't made attempts. CPU

Read the rest in "The AnandTech Guide To PC Gaming Hardware" available now in paperback for $39.99 MSRP. Check it out before you upgrade or build your next power gaming rig.

## The Front Door

**"The AnandTech Guide To PC Gaming Hardware" covers much more than we can include in these pages. Take a peek at the Table Of Contents to get a better idea of what you'll find within the hallowed pages of this book.**

by Chad Denton

# Road Warrior

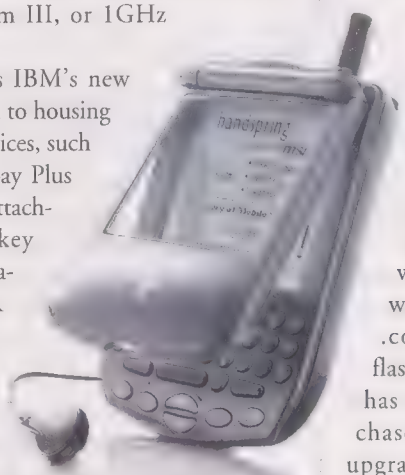
## IBM Revamps, Handspring Releases & More From The Mobile Front

### ThinkPad Shakeup

In October, IBM (www.ibm.com) announced changes for its notebooks, including the end of one line, the introduction of a new one, and new features across all models.

The low-end i Series got the ax and the new R Series was introduced in its wake. The R Series will feature the same physical design (size and weight) as the T Series and use components featured in the low-end A Series. The new chassis means the R Series will be able to share optional components, such as port replicators, with other ThinkPad models. The new systems will start at $1,214 and ship with 900MHz Celeron, 900MHz Pentium III, or 1GHz PIII processors.

The R Series includes IBM's new Ultrabay Plus. In addition to housing existing Ultrabay 2000 devices, such as optical drives, the new Ultrabay Plus accepts a Device Carrier module for attaching various peripherals, including a 10-key numeric keypad for number crunchers and a Palm synch cradle. IBM will include the Ultrabay Plus in all T, A, and R Series models. The A Series will feature one standard Ultrabay 2000 and one Ultrabay Plus. ▲



### A Fresh Face

Just as we were going to press, Handspring (www.handspring.com) announced its Treo 180 model. The company's first wireless device will run the Palm OS and operate on GSM networks similar to Handspring's Visor Phone. The Treo will cost $399 if you sign up for service activation when it's introduced early in 2002. The Treo 270 is due out later in the year and will include a color display. ▲

### New PDAs, No Big Deal

Earlier this year, Palm (www.palm.com) introduced the m500 and m505 high-end models. Many were unimpressed with the m505's color display, but both units feature some big enhancements, including a SD/MMC slot and a universal method to connect peripherals. Conversely, Palm's annual fall release was underwhelming, especially considering rumors that Palm might release a new wireless PDA. What Palm introduced was the m125, which combines physical aspects of the m100 and m105 with a 33MHz Dragonball processor, SD/MMC slot, and Palm's Universal Connector. It sells for around $250.

Not to be outdone, Handspring's release of the Visor Pro and Visor Neo was also met with some lackluster reaction. The most significant addition to either is the Visor Pro's 16MB of memory, making it the first Palm OS device to break the 8MB barrier. The Visor Pro sells for around $300 and the Visor Neo for about $200. ▲

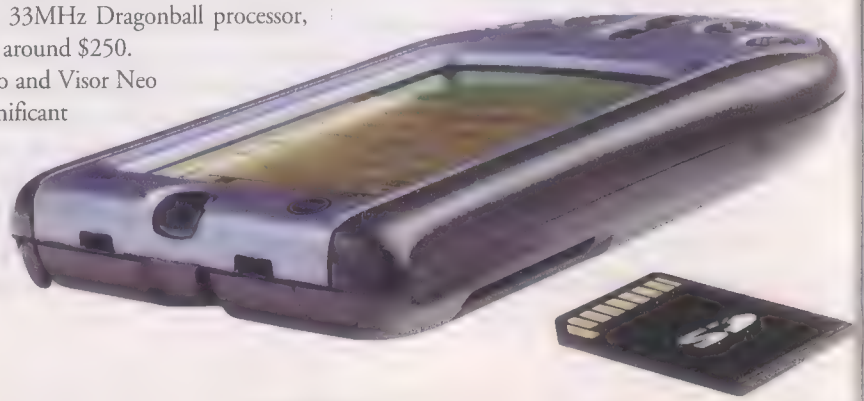
### Focus On Enterprise

Microsoft's October release of the Pocket PC 2002 operating system (www.pocketpc.com) includes a redesigned skinable interface and list of new features designed to attract corporate interest.

Included in Pocket PC 2002 is support for Virtual Private Networks that let you securely connect to your company's corporate network. Using VPNs will let you synchronize sensitive information to your Pocket PC device from any Internet link. New alphanumeric passwords help protect sensitive company data if your Pocket PC should be stolen or misplaced. The new OS also includes support for 802.11b, CDMA, and even Bluetooth.

The OS also includes flash memory support, which will enable users to upgrade the OS without having to replace any hardware. Compaq's (www.compaq.com) iPAQ Pocket PC includes flash memory already. The company has announced that users who purchase an iPAQ before Nov. 30 can upgrade to Pocket PC 2002 for free. Compaq also introduced three new iPAQ models—the H3760 ($499), H3850 ($599), and H3870 ($649)—all running Pocket PC 2002 and shipping with 64MB of RAM. The H3870 model includes integrated Bluetooth.

Hewlett-Packard (www.hp.com) introduced the new Jornada 565 (32MB of RAM) and Jornada 568 (64MB of RAM). Estimated retail prices are $599 for the Jornada 565 and $649 for the 568. ▲



# Macro Mania, Part 1

## Automate Your Excel Tasks

ANOTHER DAY AT THE OFFICE, AND YOU'RE WONDERING WHY THE GUY IN THE CUBE NEXT TO YOU ALWAYS SEEMS TO GET HIS WORK DONE FASTER. RULING OUT THE POSSIBILITY that it's just you, you figure he must have a few tricks up his sleeve. And he just might. Your co-worker may have mastered macros.

Macros are a series of keystrokes or mouse clicks you can use to automate a process. Think tape recorder: Once you record the sequence of keyboard strokes or mouse clicks necessary to get a job done, you can play them back with the press of a button. To see how useful macros can be, think about the steps involved in preparing that pesky monthly report for which your boss is always yelling: You open an existing Excel workbook, add a sheet, import data from Access, format the information, create a chart based on it, and then print the whole thing. Get the boss off your back in a hurry by creating a macro that quickly and accurately completes the steps for you.

Besides churning out that report each month, learning to write macros will help you do your Excel work faster, slicker, and smarter than those with whom you rub elbows each day. In this first of a three-part series, we'll show you how to create macros using a toolbar built in to Excel, and then how to launch them using keyboard shortcuts. From there, we'll go behind the scenes to look at VBA (Visual Basic for Applications), the programming language used to develop macros. You'll learn how to tweak the code you create when writing a macro. And as if that weren't enough, we'll also show you how to write some VBA code from scratch.

### The Toolbar That Would Be Tape Recorder

The easiest way to record Excel macros is to use the point-and-click method: You turn on the "tape recorder," record the steps you want to include in the macro, and then stop the recording. Then you can play the macro back as many times as you want to automate a task. The beauty of this method is you can record and run macros without knowing a scrap of Visual Basic. Instead of creating VB code from scratch, you interact with the Excel interface by recording the sequence of commands you want. Excel automatically creates the code for you behind the scenes.

You'll want to start by mapping out the exact steps and command sequence that will give you the result you have in mind. It's a good idea not only to sketch the steps out on paper, but also to work through them a couple of times to work out any glitches. Groping around for the correct command in the middle of a macro recording session will just make you look silly, and no one needs that.

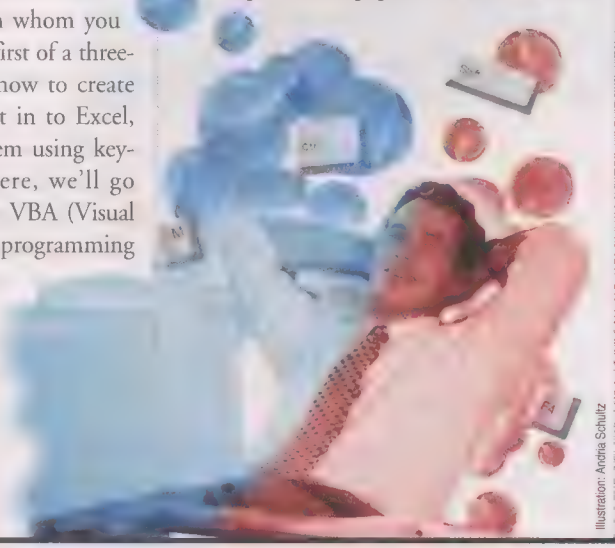


Illustration: Andria Schultz

Next, you can (but don't have to) turn on the Visual Basic toolbar, which gives you quick access to the most commonly used buttons for creating and running macros. Just right-click a toolbar and then choose the toolbar from the list.

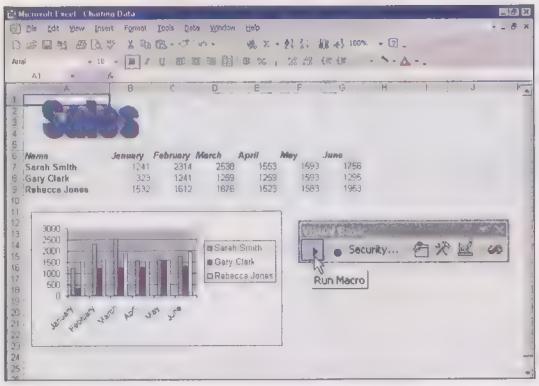
You'll probably need to set the security level for your system, too. Here's the skinny on the security levels: If you choose the High security level, you can open workbooks with macros, but the macros will automatically be disabled. Setting the security level to Medium means that Excel will check in with you whenever you open a workbook to see if you want to enable the macros or not. The Low security setting is a pretty meager barrier; Excel won't display any warnings before it opens macros, even if they're from a nasty source.

To change the security level, click Security Level on the Visual Basic toolbar and then choose the level you want. If you can't change the security level using this method, your system administrator is most likely blocking you out. Also, if you work for an organization that has disabled VBA, you're probably stuck creating macros only on your home system.

### Spend A Little Setup Time

Click the Record Macro button on the Visual Basic toolbar or choose Tools, Macro, Record New Macro. Either way, the Record Macro dialog box pops up so you can identify the macro with information such as its name, associated keyboard shortcut, and description.

The thing to keep in mind when you name the macro is you can't use any spaces or characters typically reserved for use by Windows, such as the backslash or asterisk.




Don't wander around through Excel's menus like a confused tourist when you work with macros; turn on the Visual Basic toolbar to make things easier.

Underscores are OK, though, and great for separating words. If you choose to enter a keyboard shortcut that you can use to run the macro, it's smart to use the CTRL-SHIFT key combination so it doesn't override resident shortcuts (such as CTRL-C). Do this by clicking in the Shortcut Key text box and then pressing SHIFT and the key you want to associate with your macro.

As for storing the macro, Excel will store macros in the active workbook. But saving a macro in the current workbook can shut the door on using it in other workbooks unless you keep the workbook open. This, of course, limits its usefulness and wastes your time instead of saving it.

If, on the other hand, you choose New Workbook from the Store Macro In drop-down list, Excel creates a spanking-new workbook that is used to store the macro. Still not happy with the choices? Choose the Personal Macro Workbook option to make the macro available whenever you're working in Excel. The Personal Macro Workbook is automatically opened (but hidden) whenever you begin Excel, which makes the macros available to all workbooks during your work session.

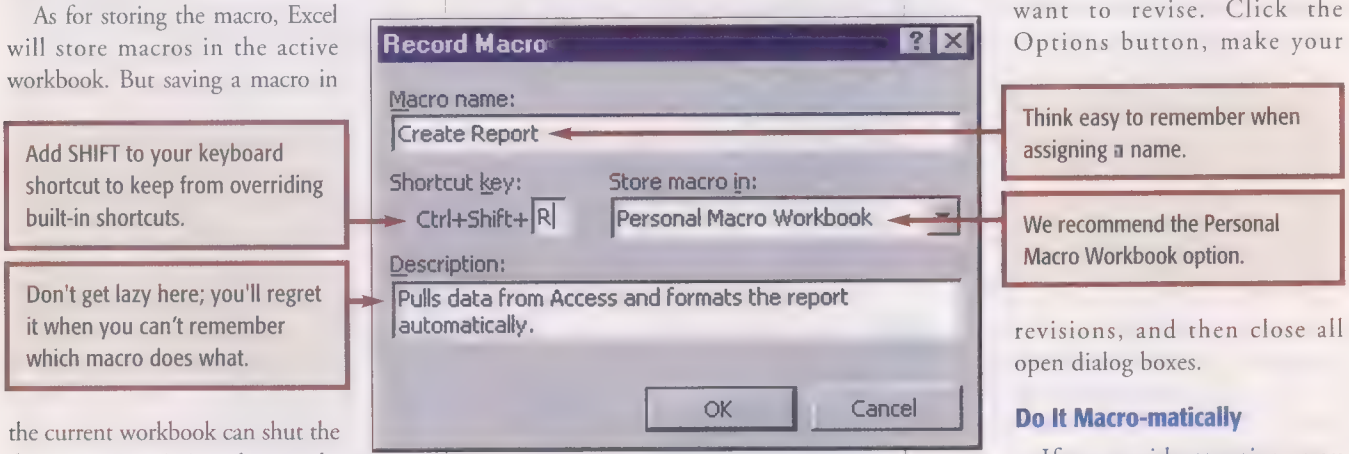
If you're lazy, you'll be tempted to skip the next step, adding a description, which would be fine except that you'll probably eventually forget why you created the macro in the first place. Do yourself a favor by writing yourself a note. You'll be glad you did.

## Ready To Record

Now that you've got all the setup out of the way, you can actually record your macro. Click OK and then work through the steps you planned ahead of time, using mouse clicks and keyboard commands. Don't panic if you accidentally make a mistake when recording the macro, though. Excel records your corrections, as well as your goofs, so the glitches will be wiped out.

You'll probably notice that the Stop Recording toolbar displays on-screen as soon as you begin recording. (If the toolbar doesn't show up, choose Tools, Macro, and Stop Recording.) Click the Relative Reference button to record steps relative to the active cell's position. After you click this button, Excel records macros using relative references until you click the button a second time. If you don't activate this button, Excel records steps using absolute cell references.

The other button on this toolbar is Stop Recording. We don't have to tell you what to do with that one, do we?




## Try It Out

Now you're ready to make your macro do all your dirty work. Click the Run Macro button on the Visual Basic toolbar or choose Tools, Macro, and then Macros. In the Macro dialog box, double-click the macro you want to run. Of course, if you had the foresight to assign a keyboard shortcut to the macro, you can use that instead. And if you run a macro and it goes haywire (or you just want to stop it in its tracks) press ESC and then click End.

What do you do if the macro doesn't behave properly? Outside of using Visual Basic for major tweaking (more about that in the third article of this series), you can delete and then rerecord the macro. Choose Tools, Macro, Macros, and then click the faulty macro on the list and choose Delete and Yes.

If you neglected to assign a keyboard shortcut or a description when you initially recorded the macro, all we can say is, "We told you so." But don't scrap the whole thing. Display the Macro dialog box and select the macro you want to revise. Click the Options button, make your revisions, and then close all open dialog boxes.

## Do It Macro-matically

If you paid attention, you should now be able to create your own macros. No more endless clicking and keyboarding through mundane tasks for you; you can accomplish most Excel tasks with macros attached to keyboard shortcuts. And just when you start getting bored with that, we'll be back next month with more cool things you can do with macros. CPU

by Linda Bird

**Is touch screen technology a bell? Or a whistle?**

**Or a drumroll announcing one heck of a presentation is on its way?**

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# Windows Registry Tweaks

## Ditch Those Default Settings

Just because Microsoft has a monopoly on PC operating systems does not mean the company should rule every corner of your Desktop. The default installations of Microsoft's three main Windows varieties, Me, 2000, and now XP, all force users to live under a series of default settings that may be counterproductive, or worse, downright irritating.

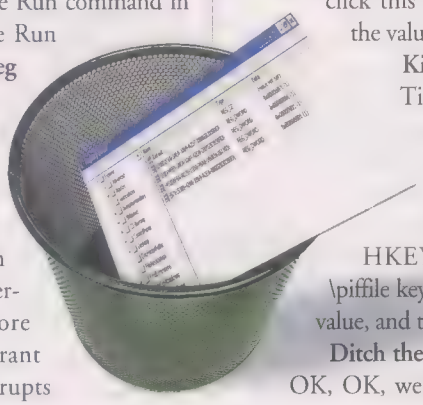
To start off this series of features on Registry tweaks for the primary Windows versions, we go after some of the least popular default settings. Unless otherwise noted, these changes only take effect after a reboot. Some edits may actually work with all Windows versions, however, we tested them on the OSes listed above. You can also use the WinMe tweaks explored here to edit the Registry in Windows 98.

To begin tweaking the Registry, you'll need to open the Registry Editor utility. Go to Start, click Run, then type **regedit** in the Open box, click OK, and the Registry Editor opens.

### Windows Me

Before modifying the Registry, always back it up. By default, WinMe does this once a day, but you can manually create a backup any time via the Run command in the Start menu. In the Run dialog box, type **scanreg** in the Open box and click OK.

WinMe also has a System Restore function that takes a picture of the system settings at regular intervals, so you can restore them later if some errant program or tweak disrupts your system. Before making changes to the Registry, you should manually set a new restore point. In the Start menu, select Programs, Accessories, System Tools, System Restore, and select the Create A Restore Point radio button. Next, name the restore point, and the program will record the current settings.



**Dragging windows.** Do you want to see all of the contents of your windows as you drag them across the screen? The default mode for dragging windows simply shows you an outline of the pane as you reposition it. With this easy tweak, you can keep the full image on-screen as you move it.

Go to HKEY_CURRENT_USER\CONTROL PANEL\DESKTOP, right-click the DragFullWindows value name, click Modify, and change the value from 0 to 1.

If the DragFullWindows value is not in the Registry, then you must create it in the HKEY_CURRENT_USER\CONTROL PANEL\DESKTOP key. Right-click the key, click New, then String Value, and type **DragFullWindows**. Next, right-click this new entry and modify the value to 1.

**Kill the shortcut arrow.** Tired of all those arrows on your shortcut icons? Go to both the HKEY_CLASSES_ROOT\lnkfile and HKEY_CLASSES_ROOT\piffile keys, delete the IsShortCut value, and then restart Windows.

**Ditch the "Shortcut to" prefixes.** OK, OK, we already know most of the icons on our Desktop are program shortcuts. Does the OS really need to eat up so much screen space adding that Shortcut To label to each of them? In order to eliminate the verbiage from new shortcuts, find HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\EXPLORER and modify the Data Value of the Link value to 00 00 00 00.

This tweak does not eliminate the prefix from existing shortcuts, only from ones created after the edit and a reboot. Eliminate the prefix from existing shortcuts, by right-clicking the icon and clicking Rename.

**Launch programs at startup.** Automate Windows to launch an executable program every time you boot up. Right-click the HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\RUN key, select New, click String Value, and type in the name of the program you want launched. Right-click the new String Value, click Modify, enter the full path to the program in the Value Data box, and click OK. If it is Windows Notepad, for example, type **Notepad** for the String Value and type **c:\windows\notepad.exe** in the Value box.

**Shrink those icons.** If your Desktop is getting overrun with large program and shortcut icons, you can shrink them by adding a new entry to the Registry. Navigate to HKEY_CURRENT_USER\CONTROL PANEL\DESKTOP\WINDOWMETRICS, create a new String Value and name it Shell Icon Size. Include spaces between the words. The value you enter determines the size of your Desktop icons in pixels. The default size is 32, so a value of 16 will halve the icon size. We found that 24 was a comfortable size that saved a lot of screen room. This tweak also shrink the size of the icons in the Start menu, so it also takes up less space when it pops up. To restore icon sizes to the default, delete the Shell Icon Size value altogether.

### Windows 2000 Professional

In Win2000, you can back up the Registry by making an ERD (Emergency Repair Diskette) on a bootable floppy diskette, which can restore older, functioning settings, including a backup of the current Registry, if something goes wrong. To make an ERD, go to Start, select Programs, Accessories, System Tools, and click Backup. One of the menu options leads you through making an Emergency Repair Disk. If you want to back up the Registry, be sure to check the menu option that prompts you to insert a blank floppy.

Unlike WinMe and XP, Win2000 has two Registry editors, Regedit and the more robust Regedt32, which gives you access to all available Registry keys and values, but does not let you search for them. In our examples, we used Regedt32. To open it, click Run in the Start menu and type **Regedt32** in the Run command box.

**Programs launching at startup.** If you have unwanted programs launching when you log on, you will have to root them out in the Registry. Go to the HKEY_CURRENT_USER subtree, locate the SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION\WINDOWS key, and find load:REG_SZ: or run:REG_SZ:. Programs listed after the colon in these entries are loaded automatically at startup. To remove the program, select either name, then click String in the Edit menu, and the String Editor appears. Delete the path and program filename you want to stop from running at startup in the Data Value dialog box.

To make a program launch automatically at startup, stay in this same spot in the Registry, but go to the Edit menu and click Add Value. In the dialog box that appears, type **load** or **run** in the Value Name box, make sure the Data Type is set to REG_SZ, and click OK. (Using the load value name minimizes programs on the Taskbar at startup, while the run command makes them start in an open window.) After you click OK, the String Editor dialog box appears. You'll need to enter in the full path and filename for the program you want to load at this time and click OK. For example, to load Notepad at startup, type **c:\WinNT\Notepad.exe** for the Value.

**Clean up roaming profiles.** On a network of Win2000 computers, a user can log onto any PC in the network and have his own user profile downloaded from the server to the local computer while he is using it. After the session, however, a copy of that user profile is stored both on the server and the local PC, which eats up hard drive space.

The following tweak lets you conserve storage space by deleting roaming profiles from the local PC when it powers down. Go to the HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION\WINLOGON key and modify the value to 1.

**Make a startup message.** If multiple users share your PC and you want to set up a greeting or warning at startup, customize a pop-up window that opens before users log on. Go to HKEY_LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS NT\CURRENTVERSION\WINLOGON and click the LegalNoticeText. Then use the Edit menu to change the String value to whatever short text message you want to appear in this pop-up box. You can also name the title bar in that new welcome box by highlighting the LegalNotice Caption value. Use the Edit menu to change the String value to a label you like.

**Change the recent Documents display.** The Documents item on the Start menu will display the last 15 documents you worked on by default. You can adjust this number, up or down, by going to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\POLICIES\EXPLORER. In the Edit menu, click Add and type **MaxRecentDocs** (all one word) in the Value Name box, and choose REG_DWORD from the Data Type drop-down list. In the Value Name box, type the number of documents you want displayed. The default is 15, but you can try numbers above or below that. If you don't want any documents listed in that menu, you can set the value to 1 to keep it empty.

**Remove the Search button from Explorer.** If you rarely use the Search option in the standard Explorer window, save yourself some room and use this tweak to remove the Search button. Go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\POLICIES\EXPLORE, open the Edit menu, click Add Value, and type the new value name **NoShell-SearchButton.** In the same pop-up window, select the Data Type REG_DWORD from the drop-down list. In the Value Data window type **1** to remove the Search button and **0** to restore it.

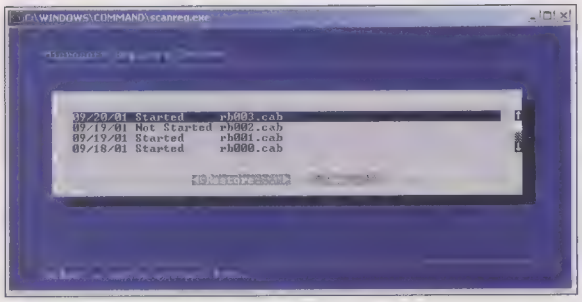
Although this tweak removes the Search button from your Explorer toolbar, the utility is still available in the Explorer Bar option of the View menu.

**Stop the fade effect.** The menu fade ins and fade outs that are part of the default settings in Win2000 can get old for some

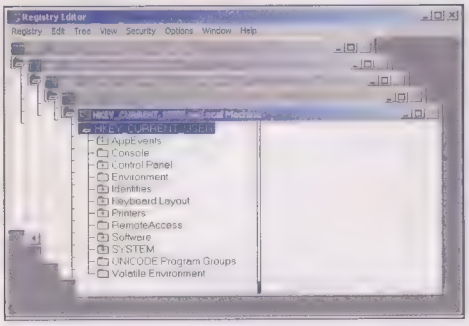
## Restore The Registry

If things go awry with one of your Registry tweaks, there are several ways you can restore your computer to a previous working state, which all depend on the version of Windows you are using. Both Windows Me and Windows XP use the System Restore function to take occasional snapshots of your system configuration. To return to a previous Restore Point, go to the Start, select Programs, Accessories, System Tools, and click System Restore, which will call up a calendar with dates and times of earlier Restore points. Select a Restore point, and Windows will reboot and load the previous state.

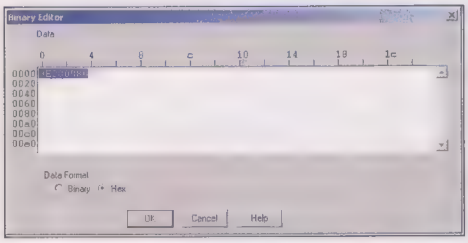
In Windows 2000, you can also use an ERD (Emergency Repair Diskette), a floppy diskette you can use to reboot your system and restore a previous version of the Registry. To make your ERD, go to Start, select Programs, Accessories, System Tools, Backup, and follow the steps for making an ERD. Another option in Win2000 is to hold down the F8 key at boot-up and select Last Known Good Configuration. ▲




Running the scanreg Microsoft Registry Checker program in Windows Me opens this DOS box, which lets you restore previous backups of your Registry.




Windows 2000 introduces the Regedt.exe Registry Editor, which divides each of the major sections of the Registry into separate Windows.




Stop the menu fade-in and fade-out effect in Windows 2000 by changing the second two digits of this binary value to 28 in HKEY_CURRENT _USER\CONTROL PANEL\Desktop.

users after about, well, 30 seconds. To switch back to the traditional menu behavior, go to HKEY_CURRENT_USER \CONTROL PANEL\DESKTOP and highlight the UserPreferencesMask value name. Open the Edit menu, click Binary, which opens the Binary Editor window. In place of the second set of numbers, 3e, type 28 and close the Editor.

## Windows XP Professional

WinXP retains the WinMe Restore System feature, so you can rescue your system from a Registry-tweaking error by restoring the system to the last point in which it worked correctly. Before altering the Registry, you can set a new Restore Point. Open the Start menu, select Programs, Accessories, SystemTools, SystemRestore, and set a new Restore point.

**Start faster.** There is a bit of a lag to the Start menu before it telescopes up off of the Taskbar in WinXP. To make it snap to attention, go to HKEY_CURRENT _USER\CONTROL PANEL\DESKTOP, right-click the MenuShowDelay value, click Modify, and change the value from 400, the default, to a lower number; a value of 1 gives you the fastest response time.

**Ditch the video effects.** Tired of the fade effect in WinXP's menus? You can make the menus pop up without the cute fade-in transition by changing one binary value in the Registry. Go to HKEY_CURRENT_USER\CONTROL PANEL\DESKTOP, locate the UserPreferencesMask value name, and modify the second pair of digits in the Binary Value box from 3e to 28.

**Shoot the messenger.** WinXP is determined to get you to use Microsoft's own Instant Messenger program, so it loads it into the Taskbar at startup. To get rid of the IM program for good, go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS \CURRENTVERSION\RUN and delete the value named MSMSGS.

**Bring back old Desktop icons.** New users of WinXP may wonder what happened to the My Documents, Internet Explorer, Network Neighborhood, and My Computer icons that were planted on the Desktop in earlier Windows versions. Most of these icons are still available for the Desktop, but they are buried in the Start menu and other menus. A few twists of the Registry keys will unlock them.

The values that turn back My Documents, Internet Explorer, My Computer, and Network Neighborhood icons all are in:HKEY_ LOCAL_MACHINE\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\EXPLORER\HIDEDESKTOPICONS\NEWSTARTPANEL.

To restore the My Documents icon, right-click the {450D8FBA-AD25-11D0-98A8-0800361B1103} value, modify the Value Data from 1 to 0, and click OK.

To restore the Internet Explorer icon, right-click {871C5380-42A0-1069-A2EA-08002B30309D}, modify the Value Data from 1 to 0, and click OK.

To restore the My Network Neighborhood icon, right-click {208D2C60-3AEA-1069-A2D7-08002B30309D}, modify the Value Data from 1 to 0, and click OK.

To restore the My Computer icon, right-click the {20DD04FE0-3AEA-1069-A2D8-08002B30309D} value, modify the data value from 1 to 0, and click OK.

**The Shared Documents folder.** The Shared Documents folder is a handy icon to have in the My Computer screen if you share files across a network. But if you don't, it is just more clutter. To eliminate this folder, find and delete the Registry key at HKEY_LOCAL_MACHINE \SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\EXPLORER\MYCOMPUTER\NAMESPACE\DELEGATEFOLDERS\{59031a47-3f72-44a7-89c5-5595fe6b30ee}. This tweak takes effect immediately.

**Give System Monitor some commas.** WinXP's System Monitor is a handy utility that gives you graphical and numerical readouts that track performance and the loads being put on your OS by any active programs or processes. Running System Monitor in the background lets you identify which programs are putting the most strain on your system. The problem is Microsoft left out the commas on the numerical counter, so numbers higher than 10,000 can be maddening to read.

To put commas into the System Monitor, go to the HKEY_CURRENT_USER\SOFTWARE \MICROSOFT\SYSTEMMONITOR key. Add a DWORD Value named DisplayThousandsSeparator. The next time you open System Monitor you'll see numbers in the more readable, comma-delimited format. CPU

**by Steven Smith**

# Quick, Fast & In A Hurry

## Speed Up Your Video Card's Performance

YOU HAVE A FRESH PC WITH A BLAZING NEW 3-D ACCELERATOR CARD. MAYBE YOU ARE A GAMER, OR MAYBE YOU HANDLE 100MB PHOTOMONTAGE PROJECTS.

Whatever the application, you paid good money to get the best possible video performance from your system. So are getting it? Probably not.

Generally, computers are configured to operate with stability and longevity foremost in mind. However, you might be able to compel your PC to run faster—perhaps even substantially faster—than default settings permit. However, the harder you push your computer, the more likely it is you'll strain components. If you overtax your PC, it will let you know by exhibiting odd behavior or even crashing. But to get the most bang for your video-performance buck, read on and try some of our optimization suggestions.

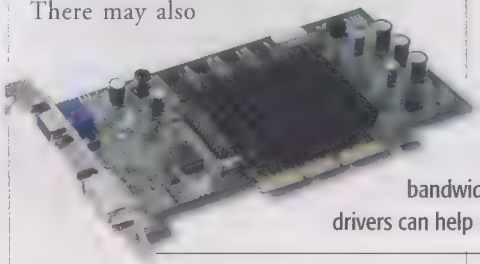
Of course, nearly all manufacturers warranty a product only if it is run under default settings. There is always a risk of damaging equipment if you operate outside of the manufacturer's suggested guidelines. If you tweak a component and it breaks, don't count on the manufacturer replacing it or giving you a refund.

### The Properties Of A Driver

The drivers a manufacturer includes with a 3-D card aren't necessarily "finished." Driver revisions, or patches, are continually in development to provide fixes for bugs, additional features, and improved performance. That said, we don't advocate downloading beta drivers, because they are still under testing and can cause system instability.

To find the version of your drivers, dig into the Display Properties dialog box (Start, Settings, Control Panel, and Display). On the Settings tab, click Advanced and select the card's driver tab, such as RIVA TNT2. If the card's manufacturer has more current drivers available (they will have higher version numbers), download the new set. On the Adapter tab in the Properties dialog box, click Change and then navigate to where the files are stored.

Depending on the 3-D card's make and model, you will encounter many options in the Additional Properties area. There may be a tab for Clock Frequencies that has slider bars to change the core and memory clock frequencies. There may also be a tab for 3D Antialiasing Settings. Antialiasing is a process that softens object edges, so they appear smoother and more lifelike. You can increase video speed by turning off Antialiasing.



The reference board for NVIDIA's GeForce3 Ti200 can perform 700 billion operations per second. It sports a massive 6.4GBps memory bandwidth and is a graphics addict's dream. However, drivers can help push the board even beyond its normal paces.

You will probably also find tabs for Direct3D and OpenGL settings. We compiled the following options from the drivers for an NVIDIA GeForce2 MX 400. For Direct3D, the Performance and Compatibility Options are already optimized. Mipmapping controls texture transfers, and you can make a trade-off between quality and speed. If you're able to select a value from 0 to 12, try 6 or 7. If there's a drop-down menu, try Blend for a middle-of-the-road compromise. PCI Texture Memory Size should be set to 0MB, because you should be running in AGP mode, not PCI. If performance degrades after changing to 0MB, you may need newer drivers. Disabling Vertical Sync can make programs run faster than the monitor screen's refresh rate, thus improving the frame rate, but the mismatch with your monitor's speed may result in "tearing," an annoying phenomenon in which screens don't appear to be drawn in completely.

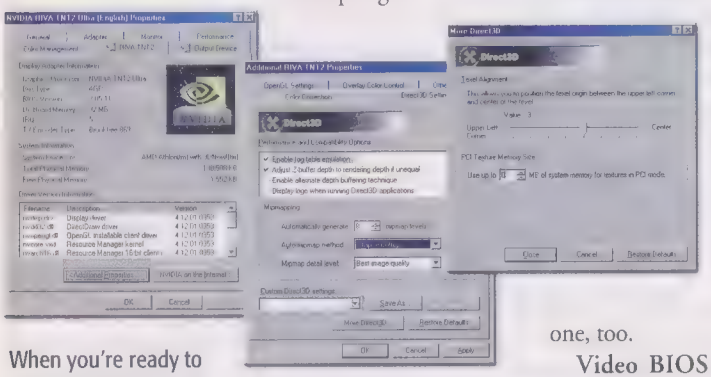
The OpenGL tab has similar choices. Check the Enable Buffer Region Extension and Allow The Dual Planes Extension To Use Local Video Memory functions only if you use 3-D modeling programs, such as AutoCAD. Trilinear and anisotropic filtering are advanced texturing display techniques that offer superior realism to the usual bilinear method. Enabling anisotropic filtering will give better-looking results, but if you want speed, disable it and stick with bilinear.

Some vendors make this process simpler. ATI's RADEON drivers, for example, offer a similar set of properties options, but provide checkboxes for Quality and Performance at the top of the dialog box, giving you a one-click method to adjust settings if you lack the patience to plow through them individually.

## BIOS Refinements

The motherboard chipset is the main intersection where all video data crosses in transit to or from the graphics card. As such, the protocols employed by the BIOS and the settings you select (perhaps unknowingly) within it can have a sizable impact on video performance.

As with drivers, make sure your motherboard BIOS is current. Unlike drivers, you don't necessarily want to implement every BIOS update the motherboard manufacturer finalizes. A bad video driver or video driver installed incorrectly can crash your system but can easily be rolled back to a stable configuration. A bad or incorrectly installed BIOS update can render your motherboard useless. As such, all the usual cautions about backing up data before attempting an upgrade apply here. Unless you know of a specific issue that demands attention, we generally recommend BIOS upgrading only about once a year. Also, download this file and the instructions for installing it from your motherboard manufacturer, not the chipset designer.



When you're ready to start tweaking, dig into the advanced Display Properties. Gamers, engineers, and graphical artists all need superior video performance, but each will achieve it in different ways.

Within the BIOS are several settings you'll want to fiddle with to enhance video performance. Consult your manual to see how to access the following options:

**AGP Aperture Size.** This lets the video subsystem borrow memory from system RAM. Obviously, this is a trade-off of enhancing video processing by stealing resources from other applications. You'll be better off increasing the AGP Aperture Size, provided you are not multitasking several programs. Typically, you'll want to set this value to either 25% or 50% of your total RAM amount. For example, if you have 128MB of RAM, set the AGP Aperture Size to 32MB at first. If you don't observe problems after prolonged use, try 64MB.

**Assign IRQ For VGA.** Set this to Enabled or Auto.

**C8xxxx-CBxxxx Shadow.** Begin with all settings disabled. Although shadowing can help increase video performance, it's also prone to conflict with other devices, which is why vendors almost always disable the function. However, you can try enabling these areas one at a time and see if they will operate with your system's configuration.

**PCI Palette Snoop.** Assuming that you are using a video card that is AGP-based, you can disable this, too.

**VGA Palette Snoop.** If you're using a modern graphics accelerator, disable this one, too.

**Video BIOS Cacheable.** Enabling this may provide a small boost at the risk of decreasing system stability.

**Video BIOS shadow.** Like other shadowing, enabling this may cause conflicts, but it can also improve video performance.

## Overclock Away

You've undoubtedly heard the term "overclocking" in terms of running a CPU at faster speeds than recommended by the manufacturer, such as a 1.2GHz Athlon set to run at 1.4GHz. The same thing can be done to GPUs by overclocking the processor core and the video memory.

As with CPUs, pay close attention to heat and stress issues. NVIDIA's GeForce2 Ultra, for example, runs with a 250MHz core and 460MHz memory. Usually, it's safe to increase these numbers by up to 10%. Because cards are different, though, we recommend increasing in increments of 5MHz. Try running the card under a heavy load at the higher speed to see how the system performs. If there aren't problems, take the next 5MHz step and so on. You'll know you've hit the card's performance ceiling when you start seeing black or blue screens (crashes) or anomalies in the graphics display. When this happens, step back 5MHz or 10MHz and run at the lower speed for a prolonged period. If there aren't hitches, you've probably found the maximum allowable speed.

How do you change the speed? Many card drivers now come with this ability built in, as with the Clock Frequencies tab in NVIDIA's drivers. If you need a third-party solution, try doing a Web search for "overclocking" or "tweak," plus the name of your video card or chipset.

Some experts feel that the relatively small performance benefit you gain by overclocking a video card doesn't justify the risk of frying the component. You can reduce the risk, however, by paying close attention to cooling factors.

If you overclock your GPU, invest in a fortified heat sink fan. Most modern video cards run hot enough that they come equipped with a heat sink, which is the ridged metal plate covering the chip to dissipate heat. Higher-end units may cap the heat sink with a fan. However, heat sink fan products may only be sufficient to serve the chip at its regular operational speed, and chances are there's no cooling applied to the memory modules. You should at least visit a knowledgeable cooling reseller—try CoolerGuys.com (www.coolerguys.com)—and then consider upgrading your heatsink fan to a more robust model.

## Drive Safely

The dangers associated with maximizing video performance are as real as the benefits. With caution and careful study of how your card's settings affect your applications, you're almost guaranteed to boost your speed with little or no additional cost. Just remember to move slowly in your quest for the best, and your equipment will deliver years of top-notch video output. CPU

**by William Van Winkle**


# Special Holiday Gift Offer

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# Hard Drive Maintenance Tips

## An Avoid-The-Crash Course

WE KNOW YOU. YOU'RE THE ONE WHOSE HARD DRIVE IS HOME TO SOME OF THE MOST IMPORTANT THINGS IN YOUR LIFE: PERSONAL AND BUSINESS files, applications, MP3s, and your Quake III top score archive. So of course you back up your hard drive faithfully; you probably even keep a secondary backup of your most valuable data.

Backing up your hard drive won't protect you from the hard drive failure most computer users dread, though. It will likely happen to you sooner or later, and probably at the worst possible time. But with a little preventive maintenance, you can keep your drive humming along for as long as possible. Here are some things you may have overlooked in your quest to keep your hard drive happy.

### Don't Rely On Drive Checks

Most users of PCs are familiar with the drive check that runs after a crash. Microsoft's ScanDisk (known as Check Disk in some Windows OSes) checks to ensure the crash didn't damage your hard drive. This automatic check is reassuring, but it's not a good idea to rely on the results of this check alone to maintain the life of your hard drive.

You can consider ScanDisk your first line of defense against premature drive errors, but only if you use ScanDisk before system crashes become common. If you wait until a problem is frequent or major, it may be too late to repair the damage. Get in the habit of running disk utilities on a regular basis, and you're more likely to catch and fix problems that may be irreparable later on.

**Bad blocks.** In particular, keep an eye out for bad blocks. Disk utilities can move data from a bad block to a new location on your drive, saving you from problems accessing that data. However, if you let drive utilities do this without notifying you, you run the risk of being unaware that your drive may be on its last legs. Check your log files routinely if you run these utilities automatically as part of a maintenance script and look for bad blocks your system is mapping out. It's normal to see a bad block from time to time, but when either a large number occur in one run or most runs include bad blocks, your hard drive is getting ready to die. Back up the data on the drive right away and consider investing in a replacement drive.

In Win9x, ScanDisk can map out bad blocks, but by default, it never checks a block that is marked bad. Disk utilities can mistakenly mark a block as bad, although it's not always the utility's fault. Few of us have the time or patience to let this long-running test repeat multiple times, even though that's necessary to be sure a block is bad.

You can use the Registry to force ScanDisk to recheck bad blocks. As always, before you modify the Registry, make a backup copy of it in case you need to revert to the previous version. Locate the Registry key at: HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\APPLETS\CHECKDRIVE\SETTINGS. (The Registry key list will only be present if you have run ScanDisk at least once prior to editing the Registry.) Modify the Settings value so that the two last digits are 04. For example, if your Settings value is B1 03 00 00, change it to B1 03 00 04. This will force ScanDisk to check all bad blocks.

Editing the Registry and running ScanDisk can cause an application to fail if the application forced a block to be marked bad as part of its installation process. This is most common in encryption programs or copy protection systems; just reinstall the application if it happens.

**Modify the default settings.** To maximize ScanDisk's ability to find errors, modify the default settings to check your disk for invalid file dates and times, invalid file names, and duplicate names. (The only additional option in Check Disk is to scan for and attempt recovery of bad sectors.) If two files in the same directory have the same name,

### Infinite Loop

**Your Reply Cost Me Two Lumps**

It takes one pound of coal to produce the electricity to send 2MB of information across the Internet.

Source: "The Internet Begins With Coal: A Preliminary Exploration of the Impact of the Internet on Electricity Consumption," Mark P. Mills, Greening Earth Society, June, 1999

ScanDisk will change the name of one of them to make it unique. Bad dates and times can cause backup programs to incorrectly back up files or bypass them altogether.

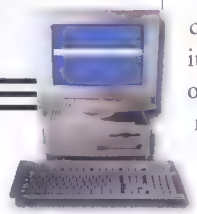
Set cross-linked files (two files sharing the same sector starting address) to make a copy. It's likely that one of the files has correct data while the other is bad. The only way to know is to create copies you can check later.

### Defrag For The Right Reasons

You already know that defragging your hard drive can speed up data read and write times by consolidating data into one or more areas of your hard drive, reducing the time needed for the drive head to find data. You may not know that defragging also increases the likelihood of recovering lost data by placing an entire file within a contiguous space. If the data is scattered across the drive, the recovery program must successfully resolve multiple FAT entries. The chances of success go down with every additional entry that must be resolved to find all the data.

To further enhance performance, you should also optimize your data. Defragging and optimizing aren't the same thing. Defragging moves individual data files into contiguous blocks. Optimizing puts related files close together for better performance. The common optimizing profile Microsoft's Defrag utility uses places similar types of files together, puts all free space near the end of the drive, and puts files that are most likely to change near the beginning of the free space.

> All computers have a CND (Critical Need Detector). The more you need the system, the more likely it is to fail.



Other common optimizing profiles available in third-party tools can put the free space in the middle of the drive and files at each end. Some profiles are designed for a specific type of use. For example, a software developer might want an optimizer to move all source and project files close to the free space area because they are the files most likely to change.

Third-party defragging utilities give you more control over how files are optimized and defragmented. Run the defragger at least once a month to ensure adequate performance, plenty of contiguous free space, and an increased likelihood of recovering data files if your drive goes south.

### Cool It

A significant but often overlooked contributor to early hard drive failure is its environment. Hard drives frequently operate in a constant whirl of spinning motion, putting tremendous stress on the disk's spindle and its bearings. This constant motion produces friction, which heats the bearings. Heat is the enemy of your drive's bearings; it doesn't do much good for the disk platters and electronics, either.

## Third-Party Drive Tools

ScanDisk and Disk First Aid work well as intended, but third-party utilities give you greater flexibility in repairing and maintaining your hard drive. If you take maintenance seriously, consider investing in one of these products. ▲

#### FATMon

**$12.98 (sharware)**
**Easy Desk Software**
**www.easydesksoftware.com**

FATMon watches your hard drive's FAT for changes; when the number of changes reaches a predefined limit, FATMon displays a pop-up window to let you know that significant changes have occurred to your hard drive's FAT. If you didn't just install or delete a large number of files, and you regularly defrag your drive, you may be seeing the initial onset of a disk error. When the FAT becomes corrupt, it starts marking used areas of your hard drive as free. Continue using your computer, and you could overwrite those areas with new data, preventing your file recovery program from being able to get your original data back.

#### Fix-It Utilities 4.0

**$49.95**
**Ontrack Data International**
**www.ontrack.com**

Fix-It Utilities features several diagnostic utilities, including a sci-fi-ish feature OnTrack calls SMARTDefender Hard Disk Failure Early Warning System. This tool can read the soft errors from any disk that includes SMART technology (Self-Monitoring Analysis and Reporting Technology). In essence, drives with this feature record when errors occur. When the error rate reaches a predefined threshold, the drive can notify you of the possibility of future failures. Fix-it Utilities can look at the error rate even if the threshold hasn't been hit yet, giving you a heads-up before a problem becomes critical. Fix-It also lets you define custom file optimization profiles for use with its defragger.

#### Norton Utilities

**$49.95**
**Symantec**
**www.symantec.com**

This is the granddaddy of disk tools. The Macintosh and Windows versions offer some different features, but at their cores are the abilities to check your hard drive for problems, defrag, and optimize. Norton Utilities can also continuously monitor your drive's performance, although we don't recommend this option because it degrades your system performance. Instead, run the tools at specified intervals.

Fortunately, drive manufacturers design hard drive mechanisms to withstand the wide range of temperatures most consumer systems see. Many manufacturers rate their drives to operate up to 55 C, or roughly 131 F. If you think you're unlikely to approach the upper range, think again. Many of today's PCs stuff hard drives into closely spaced drive bays that limit airflow. Cram a few other devices into the drive bays, such as CD-RW and DVD drives, Zip drives, and additional hard drives, and you quickly choke the already limited airflow with cables snaking around the drive bays.

Now toss in the heat generated by the rest of your computer. High-speed processors, high-performance video cards, and power supplies all contribute heat to the computer case. Many systems have fans to dissipate the heat from these devices, but in many cases, they dissipate the heat into the air inside the case. We've seen cases in which the only cooling system is the power supply fan blowing air across the power supply and into the case. Mix inadequate cooling and a hot, humid day, and you have a recipe for shortening your hard drive's life.

Fixing cooling problems can be as simple as rearranging the cables going to your hard drive so they don't block airflow. If the inside of your computer, especially around the drives, looks like a rat's nest of cables, it's time to bite the bullet and make cleanup a priority. If there's not enough room to tidy up, consider replacing some or all of your drive's data cables with round versions instead of the common flat cables. Round cables cost a bit more, but their reduced bulk allows greater airflow in and around your drives. If you're still having airflow problems, consider adding dedicated fans to the hard drive bays. These fans are available from many computer stores and online sources, and they usually mount to the hard drive rails or to the faceplate of the drive bay. They may make your system noisier, but they will keep things cool. As a bonus, improving your case's cooling will benefit not only your hard drives, but all of your computer's components.

IF THE INSIDE OF YOUR COMPUTER, ESPECIALLY AROUND THE DRIVES, LOOKS LIKE A RAT'S NEST OF CABLES, IT'S TIME TO BITE THE BULLET AND MAKE CLEANUP A PRIORITY.

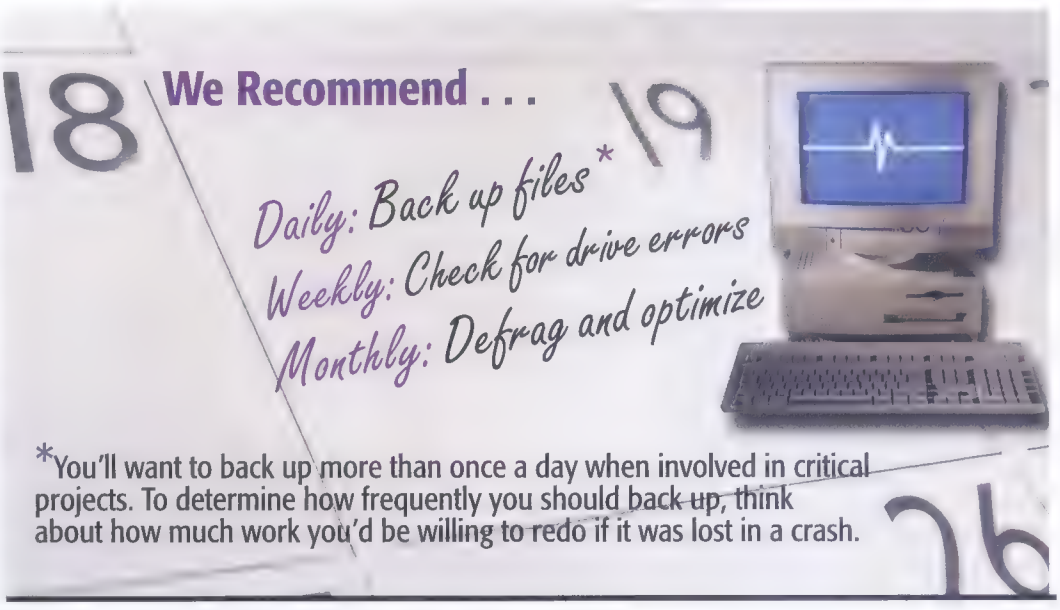
### Keep A Lid On Power

To some, this may seem an unlikely ally in the war against premature drive failure, but as we mentioned above, heat is the enemy, and spinning down a drive will reduce the heat generated. Most current operating systems and motherboards support some form of power management, usually by specifying a time frame of inactivity when you can put your monitor, hard drive, and computer to sleep. On the down side, some power-management tools have a tendency to hang up when attempting to wake up. If your computer's power-management program works well, make use of it and set your hard drives to spin down when not in use. The time to set depends on your work habits, but after 30 to 60 minutes of inactivity is a good range for most people.

### Be Diligent Or Be Sorry

Being diligent about maintaining your hard drive may mean never having to say you're sorry to your boss for losing the only copy of an important file. Don't wait for a hard drive crash to ruin your day. Stay on top of potential problems with diligence, scheduled maintenance, and a good selection of software tools. CPU

**by Tom Nelson and Mary O'Connor**



by William Van Winkle

## Wanna Super-Size That?

When it comes to optical discs and laser wavelengths, size does matter. Data on discs is essentially a series of pits and flat areas on a disc's surface. A laser passes over a disc's surface and reads the depths of these features as 0s or 1s. However, if a pit is smaller than the laser's wavelength, the light may not be able to recognize the surface feature. Because CDs use infrared lasers with a 780nm (nanometer) wavelength, they can hold 650MB to 700MB of data. DVDs use red lasers, which have a 650nm wavelength, yielding 4.7GB of data per disc layer. Shorter wavelengths mean smaller pits, and thus, more data in the same space. Blue laser systems are expected to yield 20GB to 50GB per disc, but the technology is still in its infancy.

The National Institute of Advanced Industrial Science and Technology (AIST; www.aist.go.jp), a Japanese government agency, in cooperation with research labs at Sharp (http://sharpworld.com/index.html) and TDK (www.tdk.com), have demonstrated a new red laser technology that delivers 125GB of storage on a single 12cm disc. Eventually, team leaders expect to reach 200GB per disc.

The process works by using two coating layers and manipulating disc rotation speed. A film layer is applied to the base of the disc, and then a registering layer is coated on top of the film. Varying thickness of the registration layer combined with altering the disc's rotation speed helps control exactly how much heat reaches and deforms the film layer. This precise control allows for smaller pits and flat areas than would be obtained by simply focusing the write beam on the film layer by itself. In fact, researchers claim to have achieved surface features as small as 85nm.

Assuming the technology matures into production, the next step would be to replace red with blue lasers. Perhaps before long, we'll be able to pop a wafer-thin terabyte of data into our pockets. ▲

# Under Development

## A Peak At What's Brewing In The Laboratory

**Fresh from the most influential R & D labs around the world, here's a glimpse of some of the technology that scientists, lab techs, and researchers are working on for the future.**

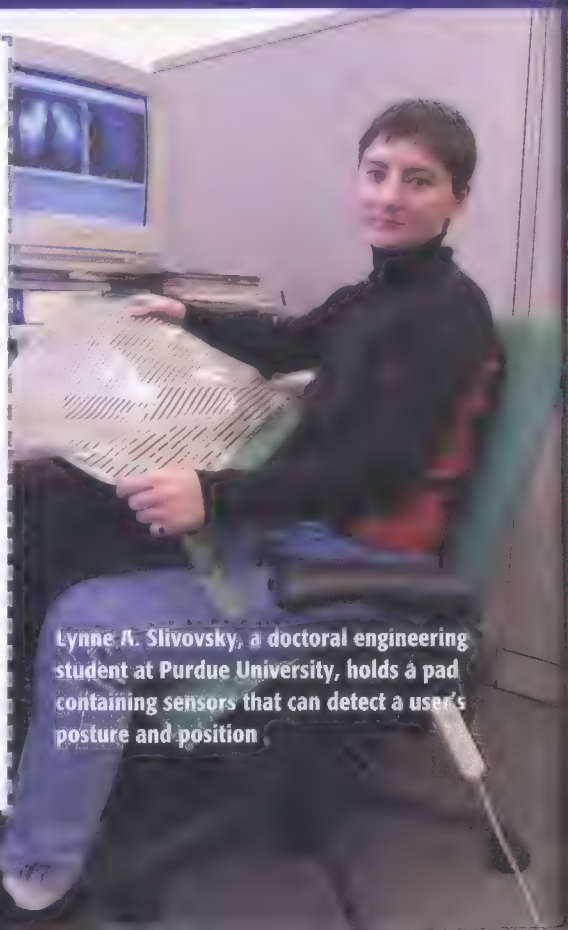
## Sit On It, Slouchy

If you are like thousands of other desk-bound tech workers, you probably have poor posture and an aching back. However, you can take some hope from Hong Tan and others researchers at Purdue University's School of Electrical and Computer Engineering http://dynamo.ecn.purdue.edu/ECE).

The group has modified a standard office chair into a "sensing chair," complete with 4,032 sensors that help determine the posture of the user sitting in the chair. The Purdue researchers have tested the chair on 30 people and found that the chair's software could tell with 96% accuracy whether users were crossing their legs, slouching, leaning in any of several ways, or actually sitting upright. Slouching was recognized with 99.8% accuracy.

The software is even intelligent enough to recognize individual users. Currently, the sensing chair can only determine "static posture," or how a person is sitting at a particular time. Soon, though, researchers hope to develop a dynamic system that will be able to monitor a user's posture over several hours. This information could be used as a biometric technology to help verify a person using a secure computer is actually who he says he is.

Ford, Honda, and Nissan are interested in the sensing chair for potential use in automatically changing driver and passenger seat support based on who is sitting in a seat. The information might also be used to configure how air bags deploy during a crash, a factor that might prevent some injuries that air bags inflict on riders, especially children. Other potential fields of applications include wheelchair users, furniture designers, and, of course, ergonomic diagnosis for office workers. ▲



Lynne A. Slivovsky, a doctoral engineering student at Purdue University, holds a pad containing sensors that can detect a user's posture and position

## Computing With Molecules

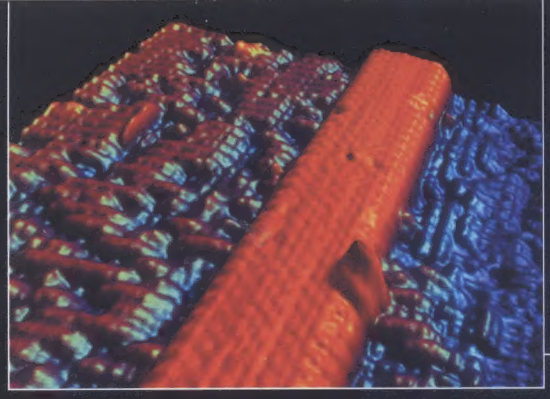
In conventional processor manufacturing, the size of transistors and other electronic features mounted on the silicon halves every 18 to 24 months. This long-standing phenomenon is known as Moore's Law. However, chip features can only shrink so far before the limitations of physics kick in. Most experts agree that conventional fabrication processes can feasibly continue for another 10 years. After that, an entirely new way of making processors will be needed if the computer industry is going to continue to evolve. Several technologies are in the running, but none may show more promise than molecular computing, where individual molecules are harnessed to perform the computational work that transistors do today.

At Hewlett-Packard Laboratories, researchers Stan Williams and Phil Kuekes have teamed with UCLA chemistry professor James Heath to move molecular computing from the pages of science fiction to reality. The trio received a patent in October 2000 for a method of building a memory device based on switchable molecules sandwiched between nanometer-scale wire grids. The grids help form a set of addresses, like conventional RAM memory, so that a memory controller may access any point within the grid based on two coordinates. This follows work by the team that nanowires measuring only six to 10 atoms wide by two atoms tall can be built in the first place.

The next challenge the group faced was making the switches and wiring practicable as part of a larger computing system. In July, the trio's efforts were finally rewarded with a patent signaling their success.

"It's one thing to just build one of these molecular arrays," says Williams, "but to interface to that from the 'our size' scale–from the scale of human beings, which is meters–getting information down to the scale of nanometers, that was a very, very tough thing. And so our most recent patent is on an invention called a demultiplexer. The idea of a demultiplexer has been around for a very long time, but we suggested a particular way to build this demultiplexer that would allow us to do it very inexpensively and be able to integrate one of our little molecular cross bar systems to normal silicon and make something that's much bigger than the two things separately."

Williams says molecular computing will ultimately catch up to and surpass present computing speeds, but the semiconductor industry has a 30-year head start. The race to accomplish 40 years of progress in only 10 years and be ready when Moore's Law expires is on. ▲



Scientists at Hewlett-Packard Laboratories in Palo Alto, Calif., have produced rare-earth silicide conductive wires about 10 atoms wide on a silicon surface, as shown in the scanning tunneling microscope image to the left.

## The Holographic Grail

Alongside advances in optical disc storage stand recent developments in holographic storage, a field IBM (www.ibm.com) has been researching since the 1960s. Grasping how holographic storage works takes a fair understanding of interference and optical physics, but suffice it to say that traditional 3-D holographic images can also be represented digitally. All it takes are two lasers—an object beam and a source beam—to create an interference pattern in a photosensitive crystal or polymer recording material.

Like two overlapping sets of waves, the dueling lasers create an interference pattern of peaks and troughs within the recording medium. The peak patterns are encoded in the medium. When a single laser is beamed through the medium, it refracts through the encoding pattern to reproduce the pattern of the opposite beam, which is picked up with an optical sensor and converted back to data. Effectively, this is the process of recording and reading information. Each interference pattern represents a page of data. Varying the light wavelength, or shifting the lasers' angles of entry into the medium, creates differentiations between pages. Hard drives access data in milliseconds. Holographic storage does it in microseconds and lacks much of a hard drive's cumbersome mechanics. Researchers ultimately expect to fit trillions of bytes in a crystal block smaller than the end of your thumb.

One of the critical keys to successful holographic storage is finding the right recording medium, a pursuit that is going on at the IBM Almaden Research Center (www.almaden.ibm.com/almaden/welcome.html). According to IBM's Hans Coufal, manager of science and technology at Almaden, the future of holographic storage hinges upon this discovery.

"We and others have made tremendous progress in demonstrating the potential for a very high-density, very high-data rate, and very fast access time data storage method, but we still are lacking a suitable holographic storage material with all the properties needed for a reliable and affordable product," says Coufal. "The ideal material depends on the specific application—write-once for archival data storage or rewriteable to compete with magnetic hard disks. But in general, any holographic material must have sufficient sensitivity to light for recording, wide dynamic range, dimensional stability, long-term stability, be available in millimeter thickness or greater so many holograms can be stored, have excellent optical quality, and be cheap. Such materials are essential if holographic storage is to be commercially successful in any established business."

Just as Edison labored through countless filament materials to find the right one for common light bulbs, IBM and others continue searching for the proper holographic storage medium, backed in part with grants from the U.S. Department of Defense. Advances in the late 1990s have been promising, though, and a breakthrough could literally come at any time. ▲

# Q&A With Vint Cerf

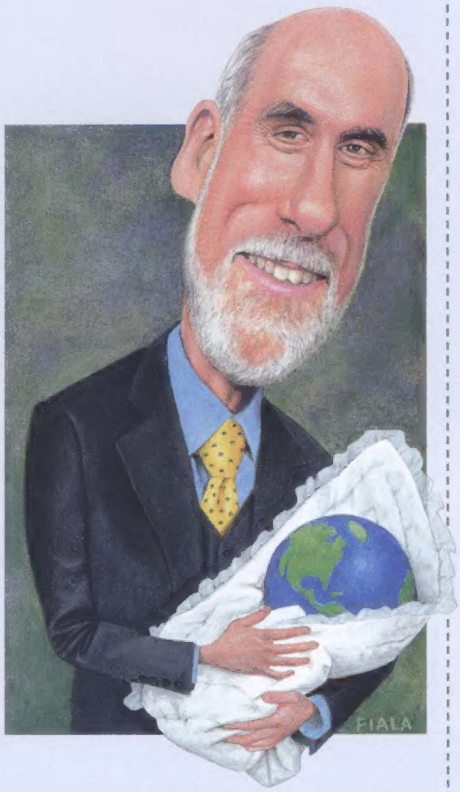
As the inventor of the TCP/IP protocol and much of the original ARPANet's architecture, Vint Cerf is widely regarded as the father of the Internet. We interviewed Dr. Cerf from his offices in Washington, D.C.

**Q Tell us about your first time with a computer.**

CERF: My first exposure to a computer came in 1958—which seems like an awfully long time ago! It was a vacuum tube-based computer called SAGE. That stood for Semi-Automated Ground Environment, and it was used to process radar information coming from the northern part of Canada in what was called the Distant Early Warning Radar Line. They were capturing radar information to see if Russian bombers were coming over the North Pole. The SAGE system was very ambitious, and processing digital information gathered from thousands of miles away. I was all of 15 at the time, and completely mesmerized by the three rooms of vacuum tubes. You had to walk into the computer and sit down inside of it to do your work.

**Q What do you consider the biggest technological breakthrough in history?**

CERF: Boy, that's a very interesting question. Plainly, the ability to make high-density computer chips was a very huge breakthrough. I would credit the Pentagon for some of that. They had a project which was designed to help train students develop large-scale integrated circuits. Up to that time, you could study the theory of how to make chips, but you couldn't actually make them. The program arranged for foundries to create silicon chips designed by students. That program also led to the creation of companies like Silicon Graphics, which was founded on the basis of a chip designed by Jim Clark when he was at Stanford.




**Q What is the dumbest thing you've ever seen a computer company do?**

CERF: That's a hard one to answer. I've seen an awful lot of stupid stuff! But I think the dumbest things that I've seen are folks who design and implement software that completely fails to take into account that something might go wrong. Write all the code as if everything is perfect, and then something goes wrong and the program crashes. I won't name any names, but there is a fairly well-known company in the Northwest that makes an awful lot of software that sometimes behaves that way.

**Q If there was one thing you could change about computing, what would it be?**

CERF: The one thing that I find repeatedly unsatisfactory is that I have enormous amounts of information that is in my machine, but it is not accessible in a way that allows me to capture it and move it to some other program. How many times have we filled out name, address, and phone number? That information needs to be available in some form where it can be handed to the next application that needs it.

**Q Who or what inspires you the most?**

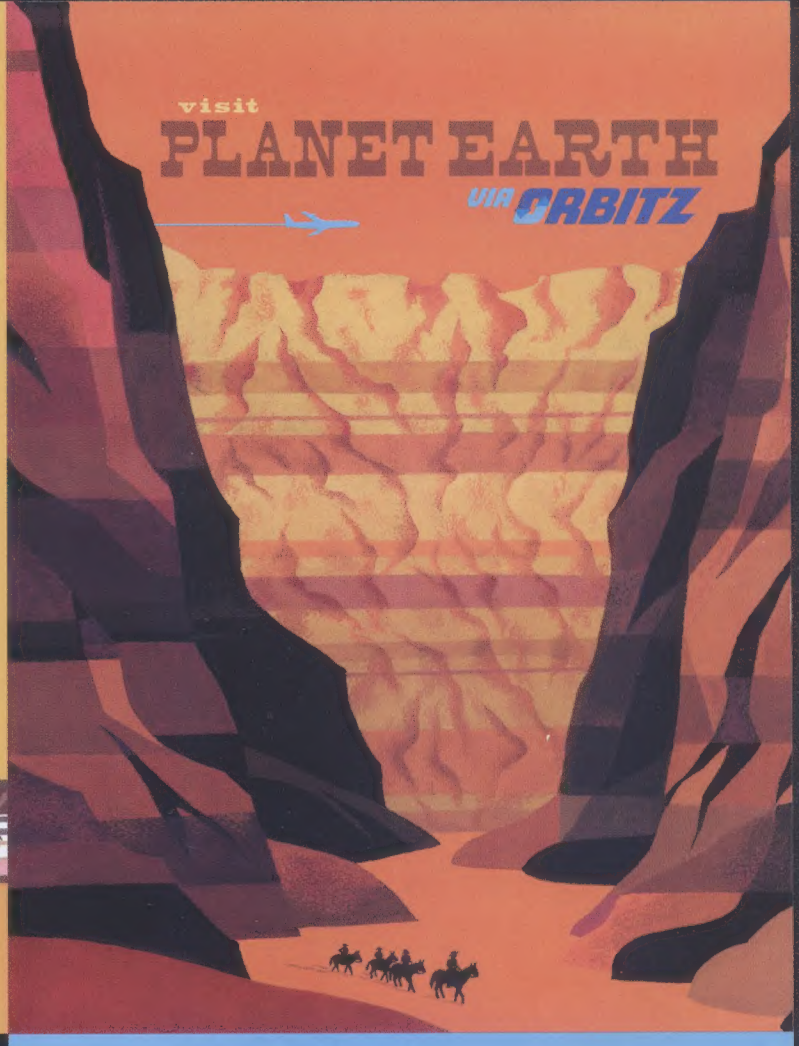
CERF: Probably the most exciting thing that I'm involved in is something extracurricular—and is also extraterrestrial! It is a joint effort with the Jet Propulsion Laboratory to design and implement an interplanetary backbone for the Internet. What we're trying to do is provide a network that can be used to support space exploration. So as we have more missions to Mars and Titan and Jupiter and Saturn, all of those missions need to be controlled. Rather than having point-to-point links, we're trying to build a backbone network that spans the solar system.

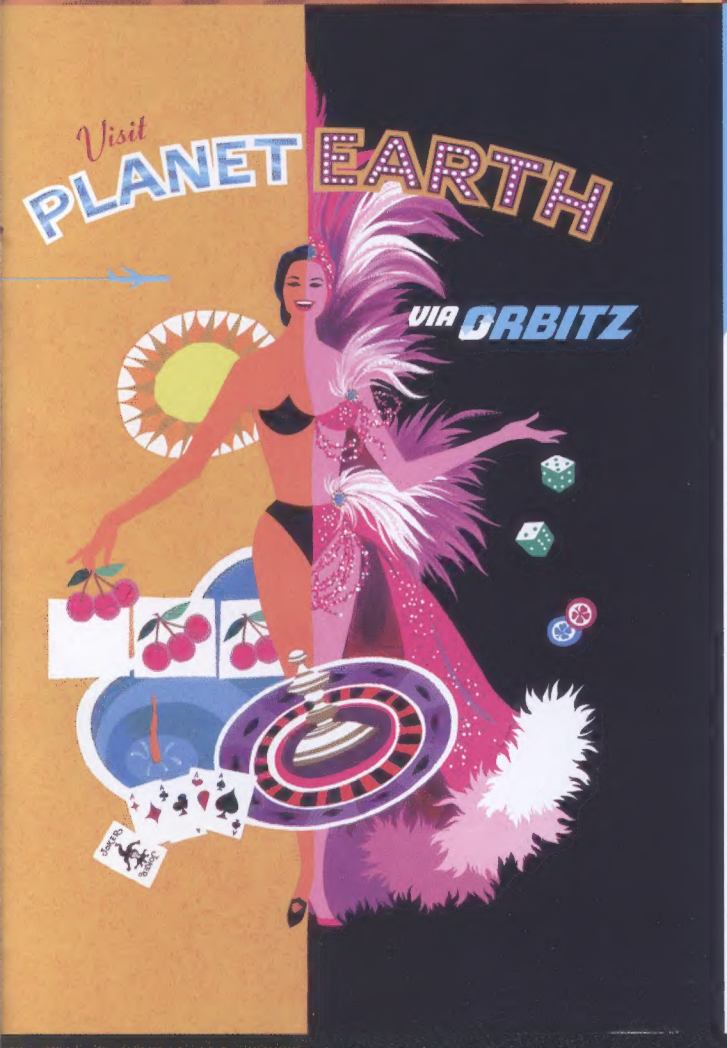
**Q What is the biggest mistake—or missed opportunity—of your career?**

CERF: The one which is weighing most heavily on my mind now is not picking a larger address space for the Internet. It is a 32-bit address space, and 4.3 billion possible devices. And I thought in 1977 that surely that would be enough for this experiment called the Internet. But what I didn't know was that the experiment wasn't going to end. So now we're moving to Internet Protocol Version 6, which has 10 to the 38th power addresses. That should be enough until I'm dead, and then it's somebody else's problem. **CPU**

**by Gene J. Koprowski**

*Gene Koprowski has been writing about the computing industry for more than 10 years for national magazines and newspapers and PBS TV.*

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